The Welding Engineer

Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

NOVEMBER, 1929 VOL. 14, NO. 11

$3.00 per year in U. S. 608 S. Dearborn St., Chicago, Ill. $4.00 per year abroad

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5 REASONS WHY

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5. Manual labor is reduced by less redressing and high speed automatic operation.

The value of these five factors cannot be rated too highly. They are of vital importance not only to manufacturers in the Automotive Industries but to every manufacturer engaged in the fabrication of metals.

Projection welding, in particular, represents a typical example of the economy effected by Elkonite. This method is rapidly replacing spot welding in all instances where one or more welds are necessary to fabricate a complete part. Any number of welds, within the capacity of the machine used, can be made simultaneously by the projection method. The saving in time and cost is obvious.

Elkonite is being used successfully not only in the welding field but wherever a hard, wear-resistant material is required. The most outstanding of these uses is found at present in its application as the bushing material in seam welding machines.

Our latest booklet, "Elkonite Die and Electrode Applications in Resistance Welding" describes in detail many varied applications of Elkonite, some of which no doubt parallel your own resistence welding problems. Sent upon request, without obligation, of course.

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these *ELKONITE* records with your own jobs:

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Job: Steel reinforcement to chassis frame
Life of Copper Dies: Impractical with copper
***ELKONITE* Dies: 50,000 welds**

Flash Welding*

Job: Flywheel ring gear
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***ELKONITE* Dies: 59,000 welds**

Seam Welding*

Job: Steel horn
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Spot Welding*

Job: Automobile Body Parts
Life of Copper Dies: 10 minutes**
ELKONITE* Dies: 8 hours*
(Machine runs at 250 welds per min.)

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Job: Roller bearing assembly
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***ELKONITE* Dies: 399,000 welds**

*Name of manufacturers using this application, upon request
**Per each redressing

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Division of P. R. Mallory & Company, Inc.
Indianapolis, Ind.

Exclusive licensees under General Electric Company patents dated May 28, 1925 and Sept. 1, 1925. Other patents pending.

ELKONITE

REG. U.S. PAT. OFF.

Dies and Electrodes for Resistance Welding

THIS is one of the many thousands of experienced operators who prefer Airco-Davis-Bournonville welding and cutting apparatus because they have found that with it they can do a better day's work than with the other makes that they have used.

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IF you are not using Airco products, a line to the nearest office listed below will bring full information.

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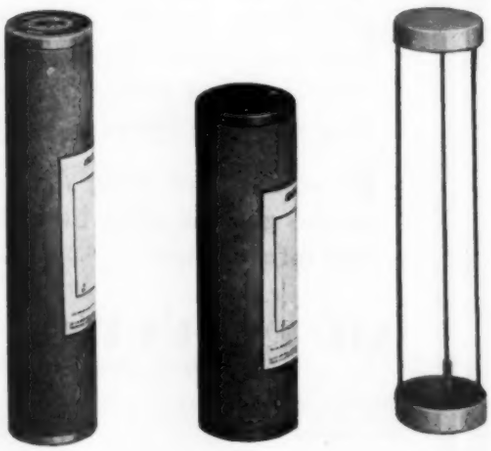
Patent applied for



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The Welding Engineer

Founded by L. B. Mackenzie, 1916

Volume 14 | November, 1929 | Number 11

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What the Other Fellow Uses

SOME of our big national magazines would find it difficult to maintain their sales even at the remarkably low prices which they charge per copy, if it were not for the value attached to the advertising pages by the public. The American people have acquired the habit of looking through the advertising pages of their favorite magazine to find out what their neighbors wear, what they eat, how they furnish their homes, how they obtain their recreation, how they make themselves comfortable, etc. There is no question about this information being far more valuable to them than is generally realized. And the same thing applies to the average progressive income producer as he goes about his work in office or factory. He depends upon publications devoted to his industry to keep him posted on new developments. The editorial pages of his business paper give him a considerable volume of detail concerning subjects which are of vital importance to him. At the same time the advertising pages tell him what apparatus, what materials and what services are being used by others in his industry and what improvements are being made which promise greater production, increased efficiency and more profitable operation. An executive cannot study the advertising section of the business paper devoted to his industry without being rewarded by valuable information.

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The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Air Reduction Sales Co.
Commercial Acetylene Supply Co.
Kansas City Oxygen Gas Co.
Modern Engineering Co.
International Oxygen Co.
Prest-O-Lite Co.

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American Steel Engineering Co.
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Page Steel & Wire Co.
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Westinghouse Elec. & Mfg. Co.

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Olympic Glove Co.

ASBESTOS INSULATED WIRE AND CABLE
Central Steel & Wire Co.

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Standard Pressed Steel Co.

BLOW PIPES
See "Torches"

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Linde Air Products Co.
Electric Arc Cutting & Welding Co.

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Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
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Torchweld Equipment Co.
Victor Welding Equipment Co.
Williams & Co.

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Bridgeport Brass Co.
Central Steel & Wire Co.
Chase Brass and Copper Co., Inc.
Mueller Brass Co.
Oxweld Acetylene Co.
Steel Sales Corp.

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N. A. Strand & Co.

BUTT WELDERS
See "Electric Resistance Welders"

CABLE (Arc Welding)
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Fusion Welding Corp.
Electric Arc Cutting & Welding Co.
General Electric Co.
Thomson-Gibb Welding Co.
Hollup Corp.
Lincoln Electric Co.
Quasi-Arc, Inc.
John A. Roebling Sons Co.
Joseph T. Ryerson & Sons, Inc.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

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National Carbide Co.
Shawinigan Products Corp.
Union Carbide Sales Co.

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National Carbon Co.
Oxweld Acetylene Co.

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Milburn, Alexander Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

CAST IRON SOLDER
Crown Aluminum Solder Co.

CAUSTIC POTASH
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Arcos, Inc.
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Fusion Welding Corp.
General Electric Co.
Lincoln Electric Co.
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Westinghouse Elec. & Mfg. Co.
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Harrisburg Pipe & Pipe Bending Co.
Wm. Wharton, Jr., Co.

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Burke Electric Co.
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Electric Welding Machine Co.
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General Electric Co.
Goodman Electric Machinery Co.
Thomson-Gibb Welding Co.
Hollup Corp.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Joseph T. Ryerson & Sons, Inc.
Shrader Electric Co.
Stoody Co.
Waters Welders, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

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General Electric Co.
Gibb Welding Machines Co.
Goodman Electric Machinery Co.
Joseph T. Ryerson & Son

ELECTRODES (Carbon Arc Welding)
See "Cutting Electrodes"

ELECTRODES (Metallic Arc Welding)
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American Steel Engineering Co.
Atlas Foundry Co.
Central Steel & Wire Co.
Edgcomb Steel Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
General Electric Co.
Thomson-Gibb Welding Co.
Hollup Corp.
Igoe Brothers
Koro Corporation
Lincoln Electric Co.
Maurath, Inc.
National Welding Products Corp.
Page Steel & Wire Co.
Quasi-Arc, Incorporated
Reid-Avery Co.
Roebling, John A., Sons Co.
Joseph T. Ryerson & Sons, Inc.
Seneca Wire & Mfg. Co.
Steel Sales Corp.
Stoody Company
Taylor-Wharton Iron & Steel Co.
Wickwire Spencer Steel Corp.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE HOLDERS
Allan Mfg. & Welding Co.
Burke Electric Co.
Electric Welding Machine Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Thomson-Gibb Welding Co.
Hollup Corp.
Koro Corporation
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Stoody Co.
Waters Welders, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE TIPS (Resistance Welding)
Elkon, Inc.

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATING EQUIPMENT
International Oxygen Co.

FACE SHIELDS (Arc Welding)
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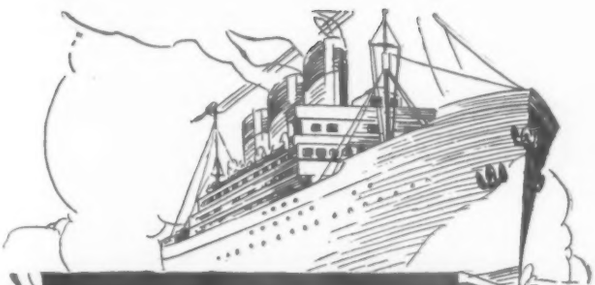
Burke Electric Co.
Central Steel & Wire Co.
Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Thomson-Gibb Welding Co.
Hollup Corporation
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc, Incorporated
Stoody Company
Joseph T. Ryerson & Sons, Inc.
Sellstrom Mfg. Co.
Westinghouse Elec. & Mfg. Co.
Waters Welders, Inc.
Williams & Co.
Wilson Welder & Metals Co.
Wilson Products, Inc.

FIREPROOF PLASTIC MATERIAL
Air Reduction Sales Co.
National Carbon Co.

FLANGES, WELDING
Bonney Forge & Tool Works

FLUE WELDERS (Electric)
General Electric Co.
Joseph T. Ryerson & Sons, Inc.

FLUXES
Air Reduction Sales Co.
Anti-Borax Compound Co.
Kansas City Oxygen Gas Co.
Metal & Thermit Corp.
Central Steel & Wire Co.
Modern Engineering Co.
Oxweld Acetylene Co.



Again ARC-WELDING *proves its* ADAPTABILITY *to practically every kind* of metal-joining job

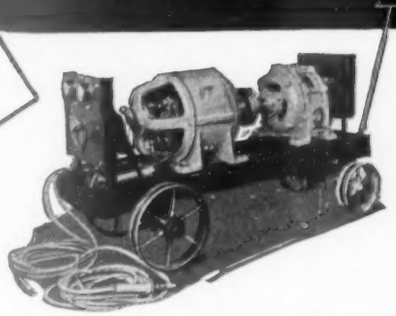
On this page is shown one of four portable apron conveyors, built for loading and unloading steamship baggage. Made of light-gauge structural steel, they were *completely fabricated* by Wilson Arc-Welding Machines and Wire.

The Conveyors Construction Corporation of New York chose arc welding after thorough investigation of other methods of fabrication—one of which resulted in warpage of the light-gauge metal, and another in weak and rocky frames.

In contrast, the *arc-welded* conveyors—made of *lighter-gauge metal*—are perfectly rigid in both horizontal and vertical planes after a year in service—handling trunks up to 400 pounds at the rate of 12 per minute.

Arc-welding is lowering production costs in practically every industry where metals are joined—producing *stronger welds at less cost*. Can you *afford* to overlook the advantages of arc-welding? You are invited to consult Wilson engineers without cost or obligation.

Whatever YOUR industry ~whatever YOUR metal-joining problem ~investigate ARC-WELDING



The Wilson Model S Welding Machine shown above is the Type 200 Amperes, one-operator, electric-motor-driven outfit.

WILSON WELDER & METALS CO. INC., 20 WILSON BUILDING, HOBOKEN, N. J.

WILSON

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Weldit Acetylene Co.

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Harris Calorific Co.
Weldit Acetylene Co.

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Ideal Face Shield Co.
Olympic Glove Co.

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MotoMeter Gauge & Equipment Corp.

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Bastian-Blessing Co.
Craftsweld Equipment Co.
Imperial Brass Mfg. Co.
Harris Calorific Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Sight Feed Generator Co.

GOGGLES
Chicago Eye Shield Co.
Ideal Face Shield Co.
Sellstrom Mfg. Co.
Willson Products, Inc.

GRINDERS (Portable Electric)
R. G. Haskins Co.
Stoody Company
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HELMETS (Arc Welding)
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Burke Electric Co.
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Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Thompson-Gibb Welding Co.
Hollup Corp.
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc, Incorporated
Sellstrom Mfg. Co.
Waters Welders, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.
Willson Products, Inc.

HYDROGEN
Gas Products Association
International Oxygen Co.

HYDROGEN GENERATING PLANTS
International Oxygen Co.

LEAD WELDING UNITS
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
Sellstrom Mfg. Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
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Torchweld Equipment Co.
Victor Welding Equipment Co.
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Kansas City Oxygen Gas Co.
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Modern Engineering Co.
Oxweld Acetylene Co.

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Shoot-a-Lite Corporation
Torchweld Equipment Co.

MANIFOLDS
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
General Welding and Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

MECHANICALLY OPERATED CUTTING AND WELDING TORCHES
Air Reduction Sales Co.
General Welding and Equipment Co.
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Torchweld Equipment Co.

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See "Fireproof Plastic Material"

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Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

NITROGEN
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Gas Products Association
Linde Air Products Co.
International Oxygen Co.

OXYGEN
Air Reduction Sales Co.
Gas Products Association
International Oxygen Co.
Kansas City Oxygen Gas Co.
Modern Engineering Co.
Linde Air Products Co.

PIPE (Iron)
American Rolling Mill Co.

PIPE BENDS AND COILS
Harrisburg Pipe and Pipe Bending Co.

PLATES (Iron)
American Rolling Mill Co.
Jos. T. Ryerson & Sons, Inc.

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Goodman Electric Machinery Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
Lincoln Electric Co.
Northwestern Mfg.Co.
Joseph T. Ryerson & Sons, Inc.
Shrader Electric Company
Wilson Welder & Metals Co.
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St. Paul Welding & Mfg. Co.

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R. G. Haskins Co.
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Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
Fusion Welding Corporation
General Welding and Equipment Co.
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International Oxygen Co.
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Modern Engineering Co.
Oxweld Acetylene Co.
St. Paul Welding & Mfg. Co.
Joseph T. Ryerson & Sons, Inc.
Sight Feed Generator Co.
Stoody Company
Torchweld Equipment Co.
Victor Oxy-Acetylene Equipment Co.
Weldit Acetylene Co.
Williams & Co.

SCORED CYLINDER REPAIR MATERIALS
Kansas City Oxygen Gas Co.

SEAM WELDERS
See "Electric Resistance Welders"

SHEETS (Iron)
American Rolling Mill Co.
Jos. T. Ryerson & Sons, Inc.

SILVER SOLDER
Handy & Harman

SPOT WELDERS
See "Electric Resistance Welders"

TANK CONNECTIONS
Air Reduction Sales Co.
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International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.

THERMIT WELDING
Metal & Thermit Corp.

TORCHES (Welding and Cutting)
Air Reduction Sales Co.
Craftsweld Equipment Co.
Bastian-Blessing Co.
General Welding and Equipment Co.
Fusion Welding Corporation
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Joseph T. Ryerson & Sons, Inc.
Sight Feed Generator Co.
St. Paul Welding & Mfg. Co.
Stoody Company
Torchweld Equipment Co.
Victor Welding Equipment Co.
Weldit Acetylene Co.
Williams & Co.

TRUCKS (Cylinder)
Air Reduction Sales Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Sight Feed Generator Co.
Torchweld Equipment Co.

VALVES
Air Reduction Sales Co.
Bastian-Blessing Co.
International Oxygen Co.

WELDING COMPOUND (for Shape Welding)
Air Reduction Sales Co.
Harris Calorific Co.
Modern Engineering Co.
National Carbon Co.

WELDING RODS AND WIRE
See "Electrodes" and "Acetylene Welding Wire"

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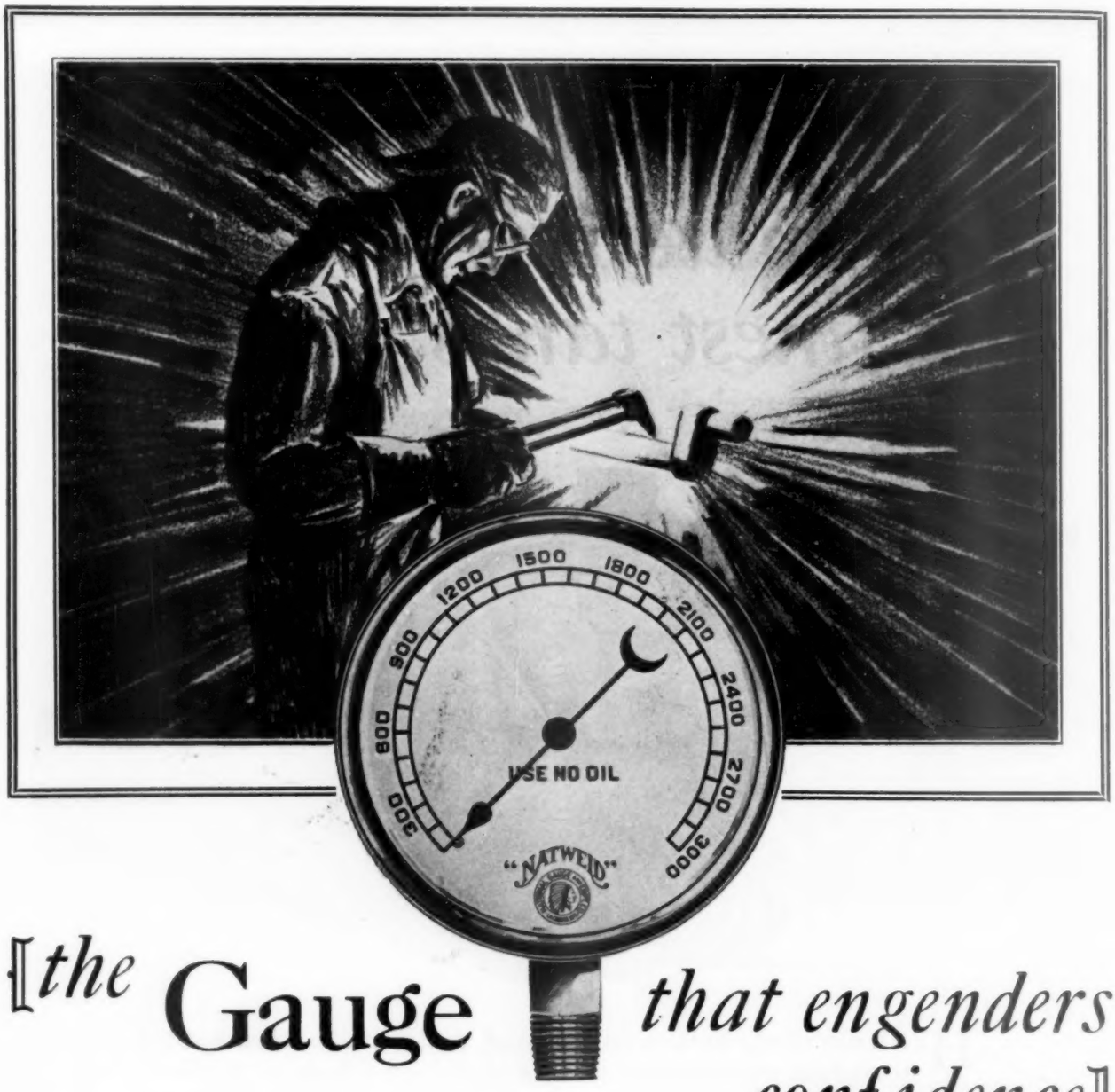

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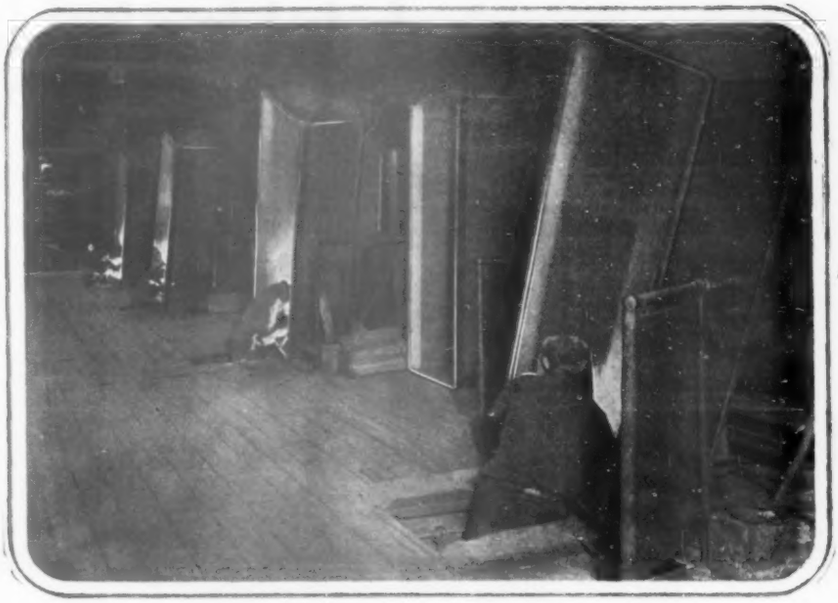

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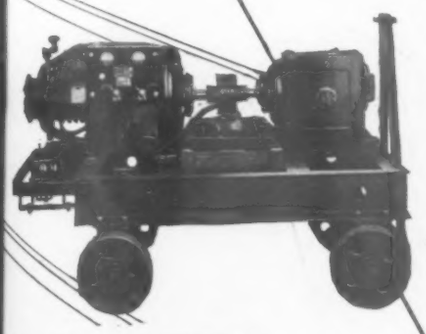
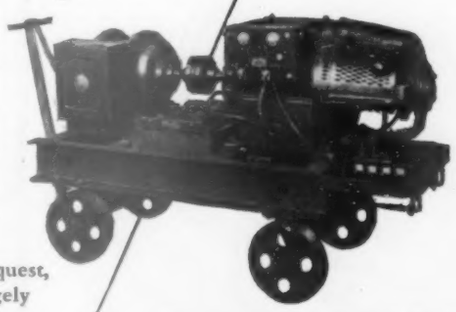
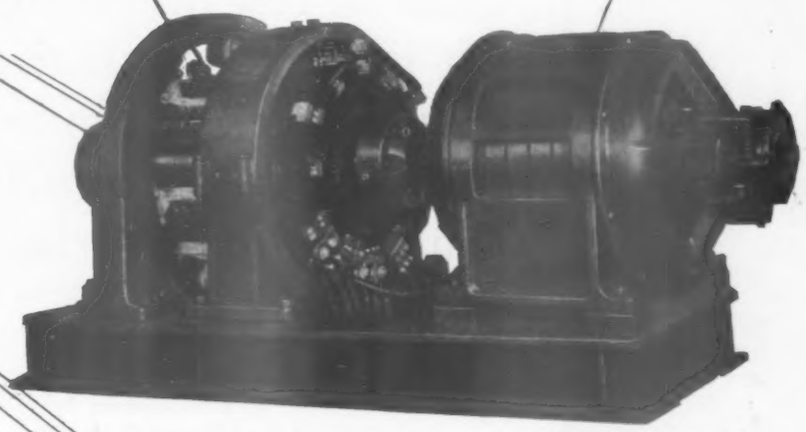


General Electric Type WD-200A arc welder. Capacity, 200 amperes



The very popular General Electric Type WD-300A arc welder. Capacity, 300 amperes



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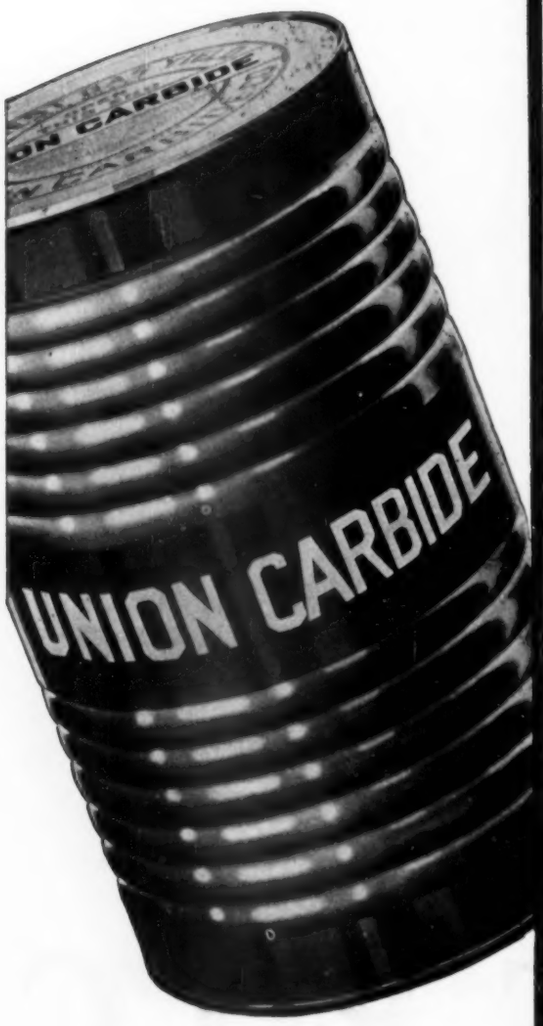

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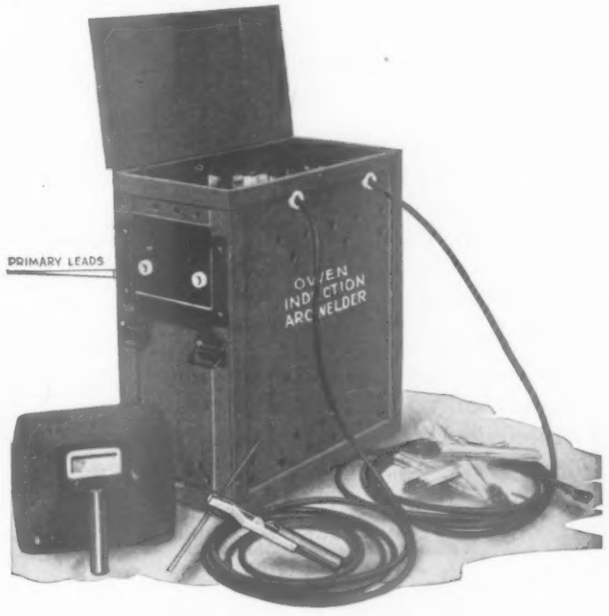

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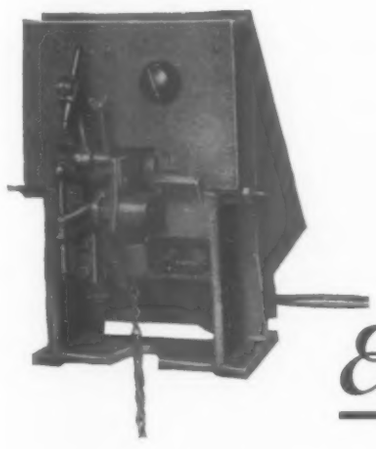

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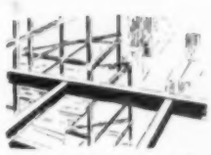
WELDING WIRES

What's Next in Welding?



IN THE STRUCTURAL steel field, welding is recognized as a coming method of assembly. City and State building codes are permitting it. Acceptable standard codes and model specifications are available to building commissions and architects. Much fundamental design data has accumulated. It is even predicted that city building laws of the future will prohibit riveting on account of its noise. An enormous new market here for all of the welding processes.

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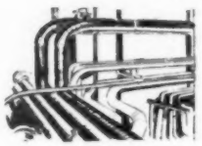

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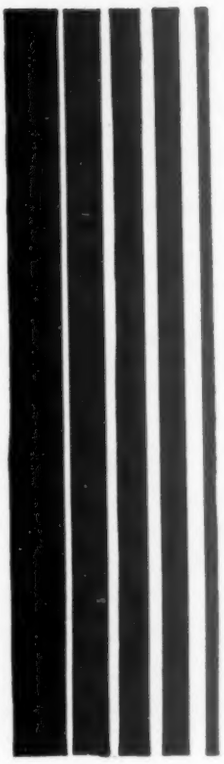

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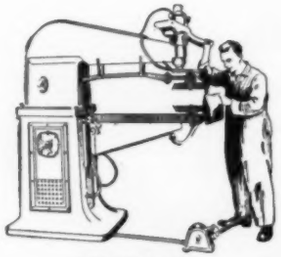

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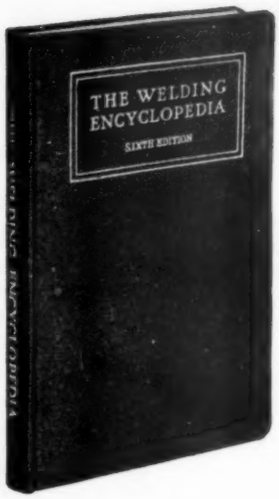

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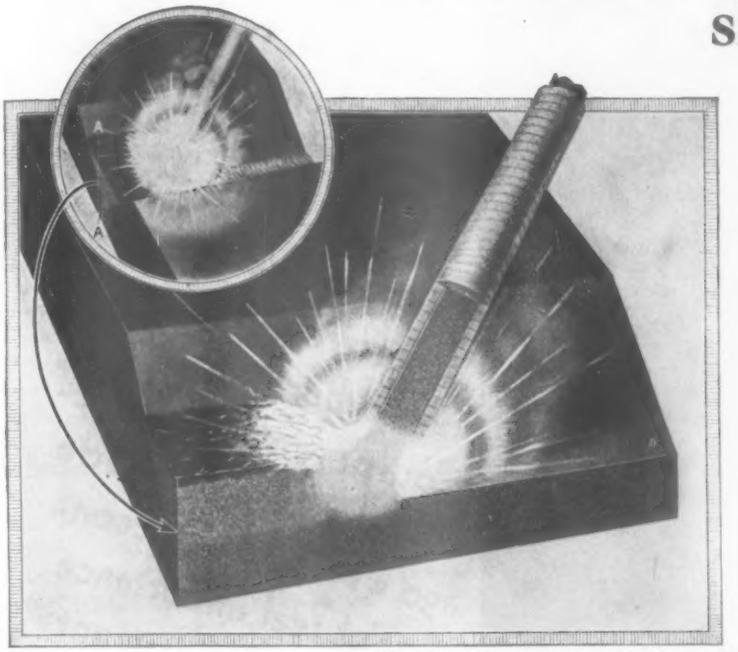

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EDITORIAL

Get Your Man

FOR an entire season the football team of a mid-western college several years ago was undefeated as the result of the persistent thinking of a brilliant young quarter back who started every play with the signal, "Get Your Man!" This unceasing admonition to his ten husky playmates, that each man on the team was expected to do his bit, made it possible to keep going ahead against all kinds of opposition. Something of this spirit should be acquired by members of the American Welding Society in support of the plan recently proposed by the Membership Committee to put on a member-for-member campaign during the remainder of the year. Every member of the American Welding Society will receive with his copy of the Journal of the American Welding Society this month a letter from the Chairman of the National Membership Committee outlining the purpose of this membership drive and urging each member to add at least one name to the enrollment. If the Society already had a very high coverage of all the industries which are using the welding processes it might be too much to expect a response from every present member. The fact is that the Society does not have such coverage at present. There are thousands of men who can profit by membership and the greater increase which is made in the membership during the next year the more the organization will be able to do for welding executives individually and collectively. It does not seem possible that any member should have to look very far to find among his acquaintances one man who does not belong and who should belong to the American Welding Society. To get that man enrolled is to do something for the new member, something for the whole Society, and, last, but not least, something for himself. This move toward getting more members is not a fund raising campaign. The Treasurer's report shows the finances of the Society to be in excellent condition although there are things which it can do to very good advantage with any additional income which might be derived from doubling its membership. The important thing from the point of view of the whole Society and of each individual member is that the work which the American Welding Society is doing is worthy of considerable more talent. It should be a very attractive proposition for industrial executives who are giving more and more consideration to welding to pool their experiences, their activities and their knowledge with others who are doing similar work and to gain what they can from this consolidated effort to extend and improve welding practice.

Welding at Biloxi

AT its Seventh Annual Convention, which was held at Biloxi, Miss., November 12th, the American Institute of Steel Construction scheduled a discussion on the merits of riveting and of welding. The Institute invited some of the best known authorities on steel rivets to present the case for riveted construction. The welding side of the discussion was presented by eminent engineering talent from the welding industry who upheld the merits of gas and electric welded construction. The strong element of popular appeal in behalf of welding continues to be the promise of relief from the terrific noise of the riveting hammer. The advocates of welding are finding by experience that this subject is of more importance than was attached to it in the early days of structural welding, but there are other very important considerations to be discussed when comparing the two methods of construction and erection. The session at Biloxi indicated clearly enough that the welding fraternity has plenty of work to do before the conquest of the structural steel field is complete. But it also showed that welding has gone steadily forward in this field, gaining more and more momentum in its progress, and can expect to develop the full possibilities ahead of it for steel erection by continuing its present energetic program. Incidentally, the program of the Institute was made of great practical interest by the demonstration of a newly designed automatic welder which has been made for the special purpose of facilitating the laying of the battledeck floor. All this is evidence that the American Institute of Steel Construction is prepared to capitalize all the advantages which welding offers for the further extension of the market for structural steel shapes. Further evidence is found in the Annual Report of Mr. L. H. Miller, Chief Engineer of the Institute. Under the subject of "Welding" in this report, attention is called to the research work in which the Institute is cooperating and looks forward to having material available within a few months for the preparation of authoritative specification. Particular attention is given to the significance of the progress which has been made in non-destructive tests of welded connections. Mr. Miller urges the fabricator to become intimately acquainted with welding so that he may be able to use it himself instead of depending upon the services of an additional subcontractor. To see the subject presented from this point of view is to realize that welding is beginning to be used in a considerable volume of structural work and that those who are close to the structural industry feel confident that this volume is bound to expand in large proportions within a comparatively short time. Those who attended the Biloxi meeting cannot fail to be impressed by these facts. It is a very significant event in the history of structural welding.

Codes Will Be Changed

IT is only a few years ago that the practicability of structural steel welding was seriously questioned. This question may now be answered by referring to the records of current building operations. There has not been a month this year when some important welded steel structure was not being erected. The list of such has extended from less than 100 to nearly 200. This steady progress is convincing and will gradually bring about the solution of the question which follows that of practicability. That is, the stumbling block of the present building codes which do not make any provision for welded construction. The American Welding Society has done notable work in the preparation of a model building code which will probably serve as the basis for revisions of existing codes in many cities. Right now the authorities in the city of New York are considering a new building code which permits welding and increases the allowable unit stresses of steel structures from 16,000 to 18,000 pounds per square inch. It will take some time to arrive at a complete revision of all of the building codes in the country, but there is a very evident trend in that direction and there is no doubt about the final outcome. The probability is that by the time that architects and building contractors are prepared to make proper use of welding, permission to use it will be written into the regulations which cover building construction.

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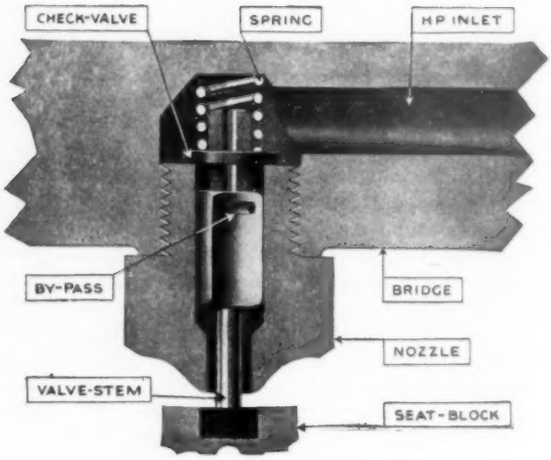

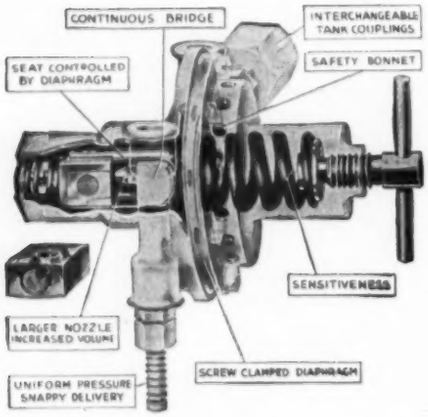

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Aircraft, Structural Steel, and Piping Are Subjects of Special Discussion at International Acetylene Association Meeting

HOW the Oxy-Acetylene welding and cutting processes are serving the basic industries of the United States and for that matter, of the world, is the general theme running through the program of the 30th annual meeting of the International Acetylene Association, which was held in the Congress Hotel, November 13, 14 and 15.

The address of welcome was delivered by Mr. E. M. Stevens, president of the Continental-Illinois Bank & Trust Company, Chicago, who spoke of the interest which the financial world takes in the development of practical applications of pure science and stated that in his opinion this welding of science and industry through association work is a dominant source of our prosperity. In responding to the cordial welcome extended by Mr. Stevens, Mr. W. D. Flannery of the K-G Welding & Cutting Company, New York, indicated that the fine hospitality always enjoyed at the Annual Convention made the members feel that Chicago is not only a center but really seems like home to all the visitors. He then reviewed the importance of the various sessions of the program. Mr. L. F. Loutrel of the Shawinigan Products Corporation, New York, president of the association, made an address in which he emphasized the fact that new developments are constantly appearing and preventing the industry from getting into a rut. He spoke in high terms of the Oxy-Acetylene Committee, the Program Committee and the Publicity Committee, and as far as the work of the Association is concerned, declared that all members are benefited from its continual activity, whether they realize it or not. Secretary A. C. Morrison, in presenting his annual report, which included a statement that the Association has reached a high point in total memberships of 247, reviewed the history of the close cooperation which has been extended to regulatory bodies of all kinds and called attention to the fact that this continued cooperation is made possible by the fundamental things which were done in this direction years ago. The keynote address was delivered by Mr. Bennett Chappel, Vice-President of the American Rolling Mill Company, Middletown, Ohio. In a series of striking word pictures of the history of iron and steel, he showed how startling had been the development in this industry during the past quarter century. He pointed out the importance of welding in the further development of iron and steel and prophesied some extremely interesting future developments which are entirely logical in view of the increased production of these metals and the highly perfected methods of fabricating them by means of welding. The talk was a wonderfully enthusiastic forecast of the possibilities of development in the oxy-acetylene industry.

No better evidence is needed to justify the claim that the oxy-acetylene processes are indispensable in all industries of major importance than the report of the Oxy-Acetylene Committee which, under the Chairmanship of W. D. Flannery of the K-G Welding and Cutting Company, has been busily engaged this year in carefully checking the progress which has been made in the advancement of oxy-acetylene applications. As in 1928 the report of this Committee is so long that it was necessary to print it in order to present it to the meeting.

Progress in the development of apparatus for welding and cutting is discussed at considerable length, special attention being given to the fact that new apparatus has been perfected for special types of work and that economies have been effected by a number of changes of design. It is pointed out that not only has the industry benefited by the introduction of new models and new devices for making apparatus more efficient, but production methods which characterize the American industry has been applied to the manufacturer so that the cost of apparatus has been considerably reduced in many cases. In connection with acetylene generators one feature of interest which is reported, is the increased use of portable acetylene generators which are of comparatively small capacity, but capable of furnishing acetylene in quantities suitable for the immediate work in hand at various points about a shop or factory or contract job, such as pipe line work, where engineering studies of commercial consideration indicate the desirability of such apparatus. Meanwhile, the use of large generator installation for large scale production welding has by no means been at a standstill. On the contrary, the trend seems to be toward increasing the capacity of present installations in many large manufacturing establishments.

In the apparatus line there is also a trend toward standardization in the structure and diameter of pressure gauges. Altogether a far better understanding of the intelligent use of gauges is being shown by the industry and as this understanding is increased there is a noticeable decrease in the number of gauges returned to the manufacturers showing evidence of misuse in service. With reference to welding materials of different metals, the following brief survey of the outstanding accomplishments in materials used in gas welding during the past year will be of great interest.

STEEL AND IRON—By the improvement in steel and iron welding rods, it has been shown that by a properly balanced combination of certain well known elements, wire is available that will produce a weld of higher value than ever before obtained and that a weld is readily guaranteed that equals in all respects the properties of the base metal. The fact that it is possible to produce a weld which is stronger than the weld itself, particularly in welded pressure vessels, has not only extended welding in this field but has also been responsible for erasing any last doubt as to the safety of welded pressure vessels.

STEEL—Low carbon steel which is practically the universal metal for construction purposes is, fortunately, one of the most readily welded metals. As knowledge of welding increases, however, it becomes appreciated that there are varying degrees of weldability in steel as in other alloys, and as the weldability of the base metal affects the weld it is possible by applying our knowledge of steel base metals, to control the quality of the weld and, through that, the reliability of the completed structure.

Steel for construction purposes is sold under various classifications, the principal of which are structural iron, firebox, flange and tank plate. For the first three of these, definite chemical and physical specifications have been prepared and the welding quality will, therefore, be quite constant. Firebox and flange quality steel are of very good welding quality and, with suitable welding rods, welds stronger than the base metal can be consistently obtained. The maximum carbon content of these steels have been found satisfactory for steel for welding. Tank steel is not made to any specification except that it is low in carbon. It may be of very good quality for welding but it may contain seams and laps that would seriously interfere with the smooth progress of the weld. The welding supervisor should, therefore, obtain steel plate of the quality that is best suited for the design from a welding standpoint.

The welding quality of the average steel pipe metal is good, as care is exercised in the manufacture to avoid laps and other major defects in the steel. Some of the higher carbon and seamless pipes, however, although of good welding quality, require rods which will give higher strength welds in order to take full advantage of the high strength of the pipe metal.

In welding the special high strength and the corrosion resistant structural steel, it is necessary to remember the purposes for which the steel was produced and the effect of the welding operation on such properties. High strength steels usually have a high yield point as well as high ultimate strength, both of which result from the composition and mechanical and heat treatment of the plate. It is frequently necessary, therefore, to use special alloy welding rods to produce strong weld metal. It may also be necessary to heat treat the weld structure to restore the high strength and yield point to the annealed metal next to the weld. When these precautions are taken, practically all the new high strength alloys can be satisfactorily welded.

CHROMIUM ALLOYS—The high chromium and chromium nickel alloys are readily welded by the oxy-acetylene process and in most cases the resulting welds are of good strength and are resistant to corrosion. The alloys that are best suited for welding are those known as the austenitic alloys for they do not harden when cooling from the welding temperature. There are a large number of these austenitic alloys on the market varying slightly in composition but their welding qualities do not vary materially. Alloys of the rustless iron type are equally as easy to weld but the weld metal and adjacent base metal are hard after welding. Annealing with a torch greatly improves this condition. Unless the welder is familiar with the properties of the particular alloy being used, he should obtain information on their welding from the manufacturer.

The principal precaution to observe in welding these chromium containing alloys is to avoid the use of a strongly excess acetylene flame. The corrosion resistance of the alloys depends upon the amount of chromium not combined with carbon, but chromium has a strong tendency to take up carbon from the welding flame and sufficient carbon can be readily introduced into the weld metal to destroy corrosion resisting properties. The welding should be done with a neutral flame because it is just as important to avoid excess oxygen as excess acetylene. With some of the alloys a rather heavy coating will form on the metal. While this can be floated, there are fluxes on the market that have been prepared specially for the welding of chrome alloys. These fluxes are a great help in obtaining sound, well fused welds.

Copper and Copper Alloys—As the result of a number of researches, it has been found that for best physical properties in the welded structure, it is necessary to use deoxidized copper for base metal rather than the commercial copper metal. This is due to the presence in the commercial copper of copper oxide which is objectionable in copper to be welded. The strength of the weld in this metal is only about 15,000 lb. per sq. in. With deoxidized copper the full strength of the copper can be consistently obtained. For such welding, copper welding rods containing such deoxidizers as tin, silicon and phosphorus are available. Fluxes are frequently used, some welding rods requiring more flux than others but good welds can usually be made without flux. Copper is quite frequently welded with the commercial bronze welding rods. The weld obtained is equally as strong as the base metal and is very easy to make.

Some of the brasses are difficult to weld as the metal boils badly and the zinc volatilizes and forms porous welds. To minimize these difficulties, it is best to use a good sized flame so that a relatively large puddle is produced. This may increase the fuming of the zinc but will reduce the porosity of the weld metal. Recently the use of the slightly excess oxygen flame for welding brass has been recommended in the literature but unless for some specific application no benefit is obtained. Special bronze welding rods are available that greatly improve the quality of the welds in brass. The principal other difficulty encountered in welding brass is the presence of lead. This is insoluble in the brass, and melts out, collecting in the weld metal and resulting in porosity. No means are available as yet to overcome this difficulty.

Aluminum—Aluminum is produced in several general types of alloy demanded by industry, pure aluminum, aluminum castings and heat treatable aluminum alloys. In general, the welding quality of all aluminum alloys is the same inasmuch as the presence of aluminum oxide is the principal difficulty to overcome. Very satisfactory fluxes are now available for that purpose and are useful for all the light aluminum containing alloys. For most of the alloys, welding rods of approximately the same composition as the base metal are used. However, there is a strong tendency recently to use a welding rod containing about 95% aluminum and 5% silicon for welding the strong aluminum alloys. This alloy is strong and due to a combination of a long freezing range and lowered shrinkage prevents the cracking of the alloy base metals when cooling from the melting point.

Hard-Facing Materials—In the oil fields, grinding mills and like industries there has been a suddenly increased demand for metal that when deposited would resist abrasion and erosion and permit the building up of worn hard surfaces equal to the original metal and the lining of tubes for longer life. Previous study, in which the need for such material was recognized, enabled the industry to readily meet this demand. The present available welding rods are mostly metals of patented compositions and are known in the industry as Eld, Hardite, Kinite, Steigleite, Stellite, Stoodite, etc.

Silver Solder—There has been a considerable increase in the use of silver solder during the past year. From the best available data the increase has been about 40 per cent.

The melting points of silver solders are much lower than those of base metal brazing solders. This characteristic makes their use desirable when strong, sound joints are necessary, and the higher temperatures required to melt base metal brazing solders would injure the metals or alloys to be joined. By varying the percentages of silver and base metals it is possible to produce strong, ductile and malleable alloys which flow freely at temperatures from 1300° F. to 1600° F. These solders can be obtained in a wide range of sizes of wire, rod, sheet or filings, and of guaranteed uniformity of quality and physical properties; thus allowing the choice of that composition and form which is best suited for the different conditions under which these solders are used.

Joints made with silver solders are strong (the tensile strength of silver solders will run from 40,000 lb. to 60,000 lb. per sq. in.) and are resistant to shocks and vibration. The malleability and ductility of these joints are decided advantages when the sheet or rods are to be worked after joining. Other valuable characteristics of silver solders are: Resistance to many kinds of corrosion, high degree of fluidity and consequent quick peneration into closely-fitted joints, good electrical conductivity, resistance to heat for temperatures not exceeding 1200° F.

Silver solders can be used with iron, steel, copper, brass, extruded brass, nickel alloys, stainless steel, and other metals and alloys that are not damaged by heating to 1350° F. or higher. Although they are called solders they are really brazing alloys, and should not be confused with soft solders which can be used with a soldering iron. Some kind of torch, preferably oxy-acetylene, because of the reducing flame that can be maintained at a high temperature, is required to properly heat the joint.

Miscellaneous Alloys—Besides the above described classes of alloys, there are now numerous alloys of all types, such as aluminum bronzes, heat treatable copper and brass alloys, special aluminum alloys and special corrosion resisting low carbon steels. Each of these alloys can be welded entirely satisfactorily provided the proper procedure is followed. For specific information an inquiry should be sent either to the manufacturer of the alloy or to a reputable welding supply manufacturer. Both will be willing to impart the correct information, which has been the result of considerable research. Of all the alloys now on the market, there are extremely few that cannot be welded or in which the completed weld is not satisfactory.

Special studies of the necessities of industry have progressed through the channels of metallurgy and every step governing the production of welding materials is generally conceded today to be the most guarded of all commercial metals. It is recognized by welding authorities that quality can only be obtained by selecting the highest grade products and that high grade metal cannot be made cheaply.

The development of any metal represents years of study, the maintenance and support of a research staff, mill and foundry procedure, etc., all of which are expensive. Therefore, welding materials secured from sources that possess such a background can be depended upon to produce satisfactory results.

As a matter of information the following figures have been developed as representing in percent the interest as shown in the gas welding of various metals during the past year:

Steel and Iron	70%
Non-Ferrous	15%
Cast Iron	10%
Alloy Steels	5%
	100%

In the application of welding metals and fluxes the following interest is observed:

Steel and Iron	69%
Bronze	15%
Cast Iron	10%
Hard-Facing Metals	2%
Alloy Steel	3%
Solders	.5%
Fluxes	.5%
	100%

The Committee report reviews some of the fundamental management phases of oxy-acetylene welding applications and proceeds to a discussion of the progress which has been made in the application of these processes in the most important metal working industries. The complete report is available in printed form and will be a valuable addition to the welding library of any plant executive.

The afternoon session of November 13th was devoted entirely to the consideration of aircraft welding. The past year has seen a great expansion in the manufacture of commercial aircraft and it has necessitated the start of operation in several new factories as well as an increase in a number of the established factories. Oxy-acetylene welding has been adopted almost universally as the standard fabrication process and it is anticipated that there will be still another increase in the use of the torch by this industry during the next four months. The speakers listed on the program for the discussion of this subject at the aircraft session were:

Major R. W. Schroeder, Gen. Mgr., Curtiss Flying Service.
E. P. Warner, Editor, Aviation.
J. B. Johnson, Wright Field.
Paul D. Paine, Universal Aviation Corp.
Chas. E. Kirkbride, Jr., Naval Aircraft Factory.
Kendal Perkins, Curtiss-Robertson Aircraft Co.
Russell F. Hardy, Waco Aircraft Co.

Two important fundamental considerations in aircraft welding were discussed by Mr. Perkins in an interesting paper from which the following is quoted:

The unit members of the primary structure of an airplane are subjected to tension, compression, bending and vibration, and their sizes are computed on the basis of one or more of these. The strength of one of such members is not quantity of force which will break the member or so deform it that it will no longer serve its structural purpose. With properly welded joints, members of chrome-molybdenum steel tubing in tension fail well away from the weld, but within the region affected by the heating of the joint. In this case the stress is evenly distributed along the tube. In a typical case, the same members in compression (assuming a large ratio of length to diameter) buckle at the ends and bend in the middle. In this case the stress is not equally distributed, but is probably a maximum at the center, nearly a maximum at the ends, and zero at points perhaps 20% of the length from the ends. Here again, in spite of the fact that the load is greater in the center, failure occurs near the welded joints. When cubjected to bending, the members are in essentially the same condition as with compression and they fail in a similar fashion. In vibration, the failure occurs as a rule, immediately adjacent to the fillet, since at this point there is an abrupt change in sectional thickness, and resulting concentration of the periodic bending stresses. These characteristics are to be expected in view of the fact that within a space of perhaps an inch from the joint, the metal is heated sufficiently to anneal and thereby reduce the strength of the tubing below that in its usual condition. On the other hand, the metal nearer the joint is heated to such a degree that in cooling, it air-hardens enough to bring its strength well above that of the annealed portion.

The understanding of the conditions outlined, therefore, for failure in tension, compression, bending and vibration will go far toward proper fitting design. They explain: why tubes, when joined end to end, should be telescoped and fishtailed rather than butted; why holes for oil circulation should be drilled as near the joint as possible, except when the joint is subject to vibration; why brazing is usually very poor practice (this is but one of several reasons); why a gusset is not of much value where a diagonal member enters a joint within forty-five degrees of another member; why reinforcing gusset plates need not usually be slotted into the tubes; why gusset plates when welded to two sides of a tube, should not extend up the same distance from the end on each side; why a concave weld is to be preferred where vibration is a factor; why chrome-molybdenum steel is of lesser advantage in units such as engine mounts which are subject to much vibration; why a tube subject to any compression should never be heated in the portion between joints; why the use of alloy steel welding wire seems unnecessary, etc.

In the foregoing we have tried to show that in a properly designed and well executed joint, failure under stress occurs not in the weld, but somewhere outside of it. Obviously then, the strength of such a joint depends not on that of the weld itself, but upon the extent to which the members welded are weakened by the process.

If the workmanship of the weld is poor, it is perfectly possible for its strength to fall below that of the annealed member, and thereby bring the strength of the joint below its maximum. If we define the "critical section" of a welded joint as *that sectional surface through which a joint will break when subjected to sufficient stress applied in the normal manner*, then the strength of the joint and the strength of the critical section are identical. In order to make this strength maximum, it is necessary to see that the critical section does not fall within the joint proper. To insure this, it is only necessary for the welder to adhere to the following three conditions: the chemical state of the base metal and filler rod must be changed as little as possible, the sectional thickness of the fillet must nowhere be less than the thickness of the thinner member multiplied by the ratio of the strength of the base metal (after welding), to that of the rod (after welding), and the filler must be perfectly fused to both base metals for a width equal to

that of the fillet itself. Strict attention to the location of the critical section of the joint is therefore of fundamental importance, and may be called the second consideration.

A welded joint designed on the basis of the first fundamental consideration and executed on the basis of the second fundamental consideration will be as strong as it is possible to make a joint with chrome-molybdenum steel tubing.

Gas Welded Building at Niagara Falls, Just Completed.

Testing of welds was the principal subject of discussion during the morning session of November 14th. Mr. H. C. Whittemore of Bureau of Standards, Washington, D. C., was elected to act as Chairman of this session. Mr. C. W. Obert, Secretary of the Boiler Code Committee of the A. S. M. E., read a paper on the subject of the Present Attitude of Authorities Toward the Welding of Boilers, Pressure Vessels and Steam Lines. Then a joint paper by J. R. Dawson and A. B. Kinzel, of the Union Carbide and Carbon Research Laboratories, Long Island City, N. Y., discussed Destructive and Non-Destructive Tests of Weld. These papers on testing were followed by a paper presented by Mr. R. C. Hosterman, of the Carbide and Carbon Chemicals Corp., South Charleston, W. Va., on Recent Uses of the Oxy-Acetylene Process in the Chemical Industry, and a paper on the Oxy-Acetylene Welding of Copper by W. R. Hibbard, Technical Dept., The American Brass Company, Waterbury, Conn.

Structural Steel Welding was the subject of the afternoon session on the 14th. Mr. E. A. Doyle, of the Linde Air Products Company, N. Y., presided. H. H. Moss, Development Engineer of the Linde Air Products Co., New York, read a paper on Gas Welding and Cutting in Structural Steel. H. M. Priest, Asst. Engineer of the American Bridge Company, New York, followed with a paper regarding the Design and Fabrication of Oxy-Acetylene Welded Buildings. Then the subject of Erection of Steel Structures by Welding was discussed by Mr. George C. Holcombe, Steel Erecting Contractor, Forestville, N. Y. At the close of the program a motion picture showed the erection of an Oxy-Acetylene Welded Building at Niagara Falls.

Further contributions to the literature on the subject of pipe welding were made at the morning session of November 15th. Mr. J. H. Zink, Heat and Power Corp., Baltimore, Md., presided. A paper on Welded Steam Piping was presented by Mr. Webster Talmadge, President, Webster Talmadge and Company, New York. Mr. A. A. Kleim, Velodrome Heating Co., Brooklyn, N. Y., read a paper on Oxy-Acetylene Welding in Domestic Heating Installations Mr. R. E. Fritsch, The Girdler Corp., Louisville, Ky., discussed the use of Tube Turns and their significance in the trend toward welded piping for all purposes. The latter part of Friday morning's program was devoted to safety consideration. Safeguarding Welding and Cutting Operations by H. E. Newell, Engr., Nat'l Board of Fire Underwriters, New York City, showed how to avoid losses and injury which results through careless methods of operation.

Mr. R. E. Manning, Associated Factory Mutual Fire Insurance Companies, Boston, Mass., then discussed some of the Recent Fire Losses Attributable to the Careless Use of Welding and Cutting Torches. There is no doubt about the safe handling of apparatus being an important subject for discussion in connection with the discussion of pipe welding in new buildings. With building materials of all kinds lying around it is essential that all operators and especially new operators be informed against the consequences which may result from the careless use of the open flame. If every individual connected with the industry does his share in this connection future difficulties from this cause will be reduced to a minimum.

On Friday afternoon, November 15th, Mr. L. F. Loutrel, President of the International Acetylene Association, presided. The first paper, entitled, The Use of Automatic Cutting Machines, presented by Otto Voss, Allis-Chalmers Co., Milwaukee, Wis., covered the importance of oxygen cutting in the fabrication of metal parts for machines.

"Our first machine," said Mr. Voss, was installed for the purpose of securing better cutting, and also to reduce the cost of the product. At the time this first machine was put in operation, we estimated that we might keep it busy for eight hours per day, but the economies resulting from the use of the automatic machine, and the very satisfactory appearance of its products lead to such a rapid increase in the application of fabricated products, that the machine operated twenty-four hours per day practically from the start.

"Several other machines have been installed at various times at West Allis, and two other plants of the Allis-Chalmers Manufacturing Company. We find that the automatic oxy-acetylene machines can be made to produce cuts as smooth as the design may require. For ordinary work, the cut surface is just about like a saw cut in wood, which is perfectly satisfactory for most purposes, but extremely smooth cuts can be produced by slowing down the speed of travel of the torch.

"The difference in the appearance of hand cutting and automatic cutting is so great that since our people have become accustomed to the work of the automatic machines, we are unable to produce hand cuts which are satisfactory for built up structural work.

"The automatic cutting torch is now used for some work on almost all of our company's products, including such articles as parts for crawler, and wheel type tractors, bases, yokes and rotors for electric generators and motors, transformer covers and tanks, drums and operating levers for hoists, guards for steam engines, parts for cement grinding mills and kilns, steady plates for condensers, etc."

Another important fundamental paper entitled, A Discussion of Safe Practice in Acetylene Pipe Line Installations was read by H. J. Grow, Research Engineer, Air Reduction Sales Co., New York. Mr. T. I. S. Boak and Mr. Paul Ullmer, Goulds Pumps, Inc., prepared a joint paper on Oxy-Acetylene Welding in the Manufacture of Pumps.

There followed the reports of various committees of the Association, including the Committee on the Award of the Morehead Medal. The medal, which is given annually for distinctive service in the field of carbide and acetylene. This year the award was made to the family of Mr. S. W. Miller, who died on February 3rd of this year. Mr. Miller has been such an outstanding figure in the welding industry that it is not necessary to dwell at length upon the importance of his contributions to the art of welding. He was nationally known as an author of one of the first books on oxy-acetylene welding and a great many special articles on the subject, contributed to the technical press. He was in great demand as a speaker at technical meetings and as an advisor in the asso-

ciations devoted to the oxy-acetylene industry. His activities were marked by a spirit of unfailing generosity and an honest, open-minded attitude toward all the questions of controversy which were raised regarding the process. Mr. Miller's intense personal interest in welding is evidenced by the fact that he himself was the donor of a medal awarded annually by the American Welding Society. Following the announcement of the award two brief talks on the subject of Mr. Miller's personality and his activities were made by Mr. C. A. McCune and Mr. J. H. Chrichett.

At the conclusion of the session the following officers were elected for the ensuing year:
President:—C. A. McCune
Vice-President:—W. D. Flannery
Secretary-Treasurer:—A. C. Morrison

STEEL PROGRESS AT CHICAGO WORLD'S FAIR

Eight scientists, known for their researches and achievements in bringing steel to its present degree of excellence, have been appointed by W. H. Eisenman, secretary of the American Society for Steel Treating, to assist him in the study of the most effective means by which the progress in steel production during the past hundred years can be exhibited at the Chicago Century of Progress celebration in 1933.

Mr. Eisenman is a member of the National Research Council's science advisory committee, which is collaborating with the Century of Progress trustees in working out a basic theme whereby the Chicago exposition may picture to the public the advances made in pure and applied science during the past hundred years.

Mr. Eisenman's associates on the Steel Treating Exhibit Committee are C. B. Murray, who will deal with ores; Arthur G. McKee, blast furnaces; H. M. Boylston, metallurgy, as related to steel making; H. A. Schwartz, casting; Zay Jeffries, non-ferrous substances, all of whom are in Cleveland. Others are C. H. Herty, Jr., of Pittsburgh, who will deal with open hearth; Mark Lathrop, Canton, Ohio, electric steel, and W. B. Coleman of Philadelphia, to whom has been assigned the study of the mechanical aspects of the subject.

Mr. Eisenman's committee is one of forty others, each of which represents a particular scientific field. The work of all the groups will be co-related by an executive committee of the Science Advisory Committee, composed of Dr. Frank B. Jewett, chairman; Gano Dunn, vice-chairman; Dr. George K. Burgess, Dr. Vernon Kellogg, Prof. M. I. Pupin, Dr. William Allen Pusey, and Dr. Max Mason. Maurice Holland is director of the committee.

A TWENTY-FIFTH BIRTHDAY

By Elizabeth Cole

We do not consider a person very old on his twenty-fifth birthday. On the contrary, he is supposed to be just starting out in life—his childhood, adolescence and youth have now passed and he is about to reap the advantages of those habit-forming and character-training years. At twenty-five he has reached man's estate with a future before him.

In considering the twenty-fifth birthday of one of our oldest organized health movements, however, we are inclined to feel that a decade has been a long period of time. The National Tuberculosis Association, which was founded in 1904 and this year celebrates its twenty-fifth birthday, has crowded these years so full of accomplishment that we are inclined, and rightly, too, to regard it as a grandfather among organizations.

When the National Tuberculosis Association was formed there was only one other non-official health agency of a national character in the entire United States, the American Public Health Association, which was organized in 1872. It had no operating program, however, and its energies were devoted largely to the publication of a magazine and the conduct of an annual meeting. Thus the National Tuberculosis Association became the first organized health promotion agency of a non-official character in the country, with a nation-wide scope and program, and has served as a model for many of the other specialized public health movements.

Laymen as well as physicians were included in its membership from the beginning and its purpose to help the country both economically as well as socially in combating the scourge of tuberculosis has been manifested in many more ways than in the chief outwardly-seen one, namely, the greatly reduced death-rate.

For twenty-five years the National Tuberculosis Association has been a leader in organized education of the public in the ways of health. By emphasizing the need for rest, fresh air, food, cleanliness, sanitary living and working places, freedom from fatigue in various occupations, as well as the need of suitable institutions for incipient and advanced cases of tuberculosis, this association has made its greatets contribution. It has made the public health-conscious.

In looking back over the twenty-five years these are some of the actual results they have helped to bring about. In 1904 there were 115 sanatoriums in the United States, with an aggregate bed capacity of 9,107. On January 1, 1929, there were 618 tuberculosis hospitals and sanatoria, with a combined capacity of 73,695 beds. There were no tuberculosis dispensaries or clinics in 1904. In 1928 there were 3,671. The first open-air school was established in Providence, Rhode Island, in 1908, and now there are at least 1,000 schools for children from tuberculosis homes or who are sub-standard in health. There were not more than ten public health nurses who devoted a definite part of their time to tuberculosis work twenty-five years ago. Now there are 7,115. There are eighty-three preventoria for children. In 1904 there were in existence twenty tuberculosis associations of which number only eight had money or active programs. Now there is a state association in every state and there are local associations in the larger cities and counties numbering 1,454.

The Association was founded for the *study* as well as for the prevention of tuberculosis and research work has been carried on from the beginning. In 1920 a formal Committee on Medical Research was organized and the influence of its coordinated studies and discoveries has already been marked.

These are briefly a few of the visible accomplishments of this twenty-five-year-old movement. In supporting its work through buying Christmas seals the funds of which are used to carry on the campaign it is well to remember that twenty-five years is a comparatively short time and that there is much more to be done. There are still over 500,000 living cases of tuberculosis in this country and in 1928 there were 93,000 deaths. There are far too many patients being admitted to sanatoria in the late instead of early stages of the disease. Although we can rejoice that the death-rate has been cut in half, yet in the age period 15 to 45 tuberculosis still takes more lives than any other disease. Here is the prime productive group of our nation, with one out of every five deaths occurring then caused by tuberculosis!

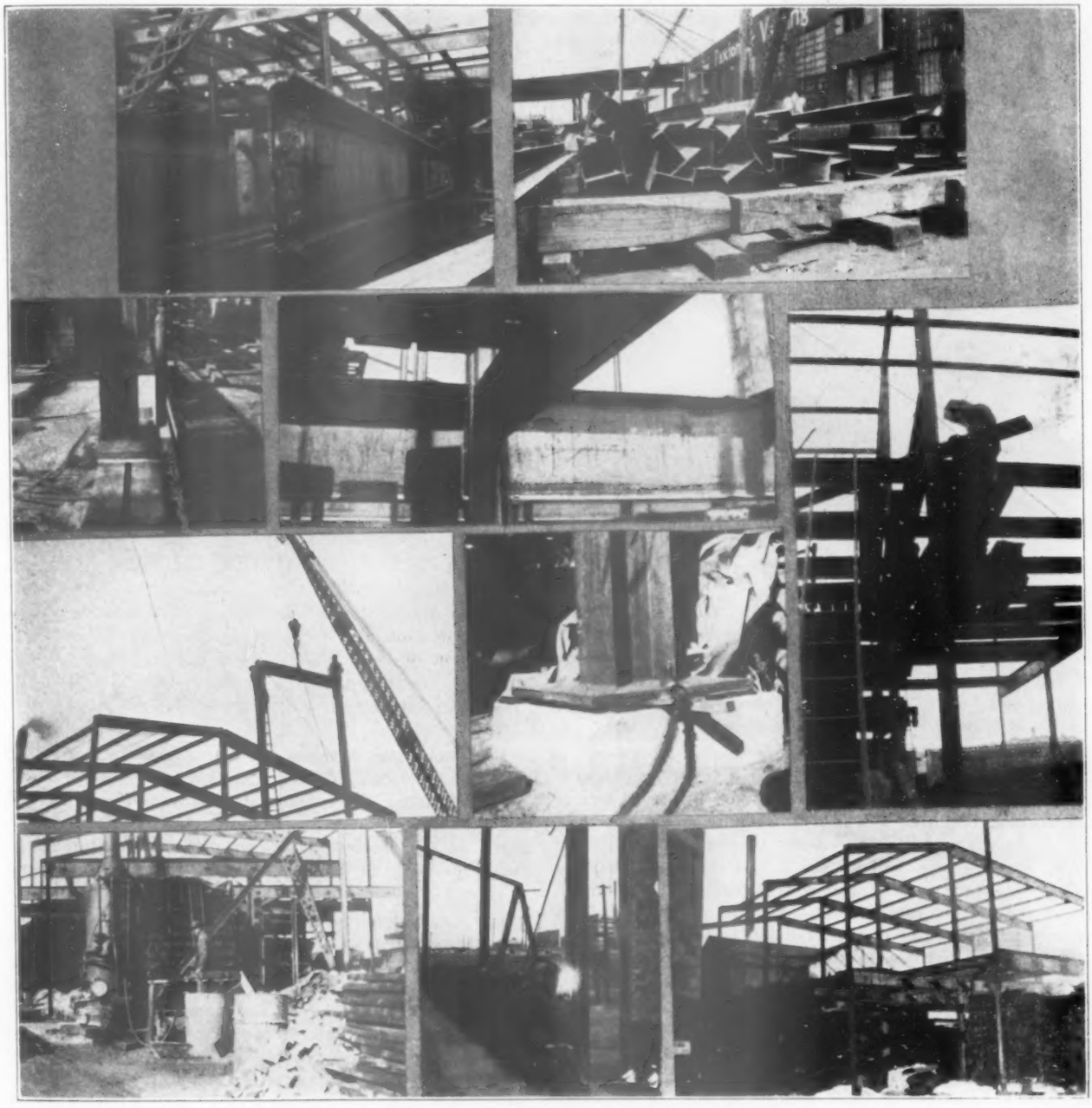
There can be no feeling of self-satisfied complacency on this twenty-fifth birthday. Rather should there be a renewed ambition to go forward. Armed with maturer experience, it will be the aim to reach that goal when tuberculosis shall be reduced to a comparative minimum.

Structural Welding In Omaha

Paxton and Vierling Iron Works Have Started the Ball Rolling in Earnest With Their All Arc Welded Ornamental Iron Shop

AN event unique in steel history for the district centering around Omaha, Nebr., is the building of an all arc welded two-story shop by Paxton and Vierling Iron Works of that city, to serve as their new ornamental iron working shop. This company has been making a careful study of arc welding for structural steel during the past several years. They have followed closely the developments in this field and have been able to put their knowledge of arc welding into practice in a number of instances. In previous issues of the **The Welding Engineer**, there have been described several of their activities in the line of welding of this class of work. When the time came to construct a new ornamental iron shop this was seized upon as an opportunity to put up an entire building which would be all welded.

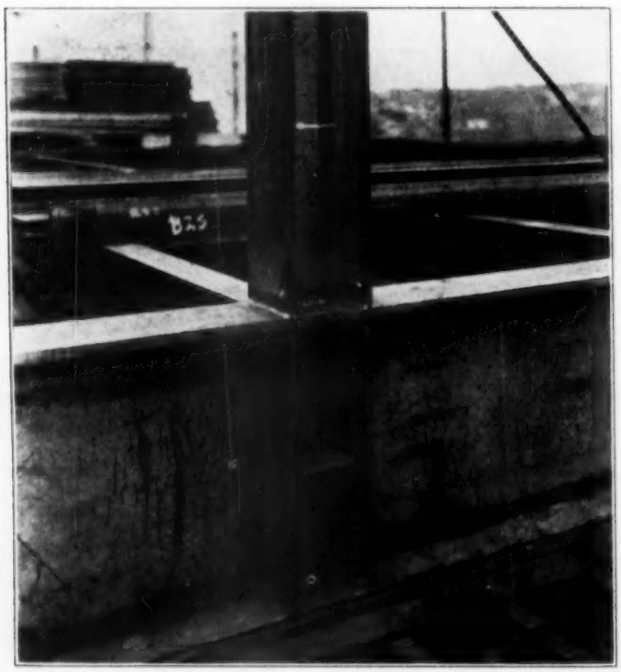
The new building is two stories high, 66 ft. wide and 92 ft. long. It is of all steel frame construction. There were approximately eight tons of structural steel used. The only construction other than welding was the use of bolts where beams connected to the erection shelf angles on the column. All shop connections and all permanent field connections were made by welding.



Views of Typical Details of Paxton and Vierling Building.

This building also makes use of the V-Deck Roof Deck, manufactured by the Shefield Steel Corporation of Kansas City. All joints in this roof and the connection of this roof

to the structural steel were made by arc welding. The V-Deck Roof Deck is made of blue annealed copper bearing sheet steel either 18, 19 or 20 gauge thickness. It is made in two finished widths. The full sheet width is 24 inches and the half sheet widths is 12 inches. Each sheet is a self contained unity, having a deep rib 1½ inches formed in it. There are four ribs in the full sheet and two ribs in the half sheet, faced 5 inches apart. The roofing of this type can be applied to practically any kind of roof, either sloping, flat or curved. It is especially desirable for roofs or large areas such as auditoriums, gymnasiums, factory buildings,



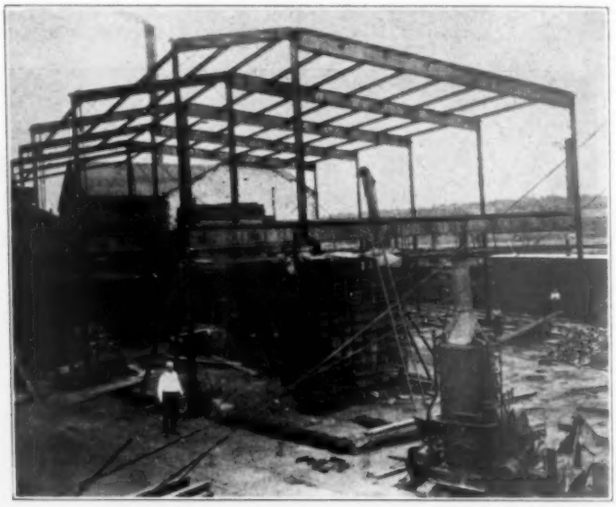
Close-up of One Interesting Assembly.

hangars, etc., because of its lightness of weight and its low cost. It can be covered with tile plate or any other type of roofing. It is easy to erect and the experience of the Paxton and Vireling firm shows that it is easily adapted to welding construction. One of the features claimed for it also is that it does not require the service of experienced mechanics. It weighs about six pounds per square foot.

The steel work required eleven hundred lineal feet of shop welding, using 320 lbs. of welding wire and 870 lineal feet of field welding, requiring 270 lbs. of welding wire. The wire used on the job was Weldite. A 300 ampere General Electric welding machine was used for the shop welding and the field welding was done mostly with a Westinghouse 200 ampere. Part of the time however, a welding cable was run out from the second story of one of the adjoining buildings from a 200 ampere Lincoln machine, making it possible to have two machines on field work for a portion of the time.

The field welding on the building started June 28th of this year. Just as soon as it was under way, letters were sent to architects and engineers in the district inviting them to come to the plant and see the building during the process of construction. Further publicity was given to it by featuring it in the stock list mailed to their customers and prospects during the summer months.

It is apparent from a study of the illustration, taken from photographs of the welding operations on this building, that a considerable saving has been made in material over what would have been necessary if this steel frame work had been a riveted job. The company is to be congratulated on its progressive spirit which led to the decision to undertake this important primary enterprise enabling them to demonstrate the practicability of welding for building construction of this type. They have used welding to a sufficient extent so that they do not hesitate to recommend it whenever it is logical to use welding in place of riveting. Now that it is completed, the engineers and architects have ample opportunity to look over the completely welded structure, see how it is designed and how the design compares with the riveted type of design and how it is standing up in service. And, incidentally, while providing this fine new building for demonstration and setting an example for the building industry of the Mississippi-Missouri Valley district, the company by taking advantage of the economies of welding has saved itself a substantial item of expense in connection with the erection of a plant addition which their growing business makes necessary.



The Structure Nearly Completed.

THE POWER SHOW

Every year the eyes of the engineering world are focused on the National Power and Mechanical Engineering Exposition, more familiarly known as the National Power Show, for a solution of the thousand and one problems that are constantly confronting them. As usual the Show will be held at Grand Central Palace, in New York City, during the week of December 2nd.

Everything that a power plant or an industry can possibly need for up-to-date efficient operation in the power line may be found among the exhibits and many of the items will be available from a number of sources. Manufacturers are showing a greater interest in suggestions and are providing for every possibility in the way of improvements and refinements to meet a constantly increasing individual demand.

The Exposition presents an opportunity for comparison of competitive machines, appliances and methods by the potential purchaser and the manufacturer's representative is better enabled to understand the problems confronting the operators and executives in his field. The manufacturer is also enabled better to cope with these problems and to visualize the extent to which his machine or appliance is applicable.

Forward looking engineers are cognizant of the fact that direct comparison is the basis of all sound buying and they have also come to know that the National Power Show presents the greatest opportunity in the world for making the ultimate choice.

The exihibits range from fuels and combustion equipment to displays covering power transmission and application, machinery, materials, belts and belting equipment, instruments, tools and supplies, heating and ventilating, refrigeration and material handling devices.

Welded Power Plant Piping

Recent Installation in New Power Plant at New Hampshire University Takes Full Advantage of Welding Economics

By Geo. F. Walker

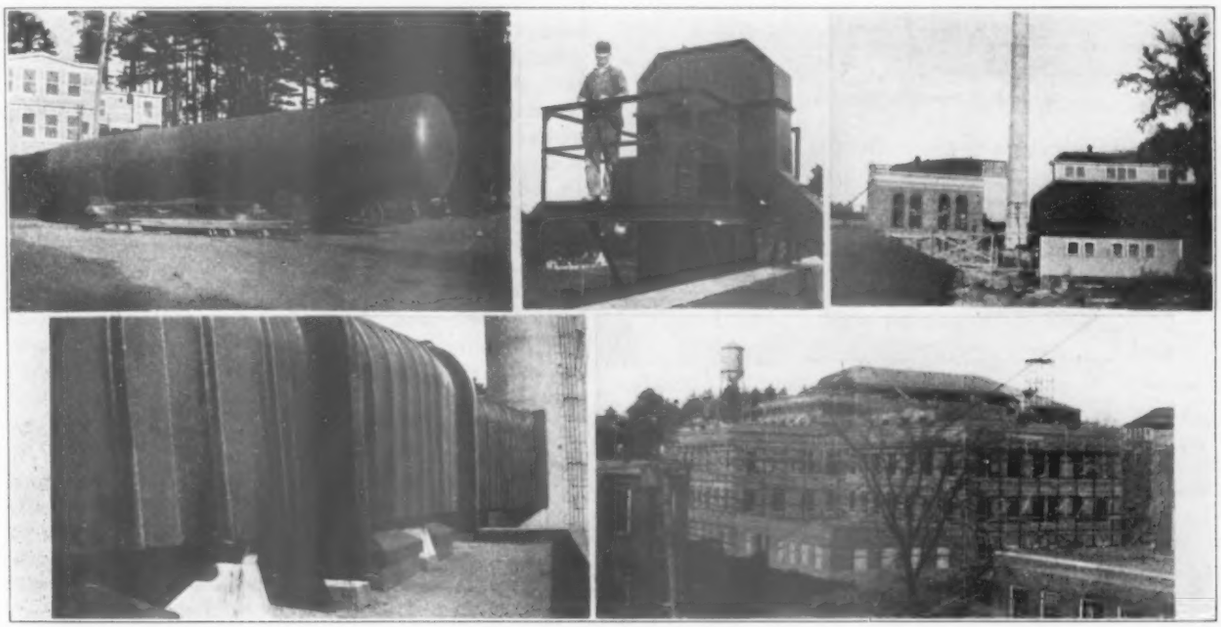
WELDING plays quite a prominent part in the new power plant installed at New Hampshire State University at Durham, N. H. Existing facilities had outlived their usefulness, as the University is growing so, and increasing its scope that a new program to take care of present and future needs was outlined. This included a new power house, which will be second to none in the country when completed. It includes three of the latest water tube boilers, coal conveying machinery, and stokers.

The smoke flue is one of the latest patent expansion type and all welded. In the power house itself there is a great deal of welding done on risers, nozzles, branch headers, connections for thermometer wells and connections for calorimeters. There is an abundance of these connections now in the system owing to the fact that this power house will also serve as a practical classroom to the engineering classes attending the college. There is a fan room where all the casings are also all welded, pump room which contains steam, fire, cold water and hot water pumps and also air compressors, steam and electric driven, and there are many connections in this room, all taken off the mains by welding.

There is a tunnel close to 1000 ft. long, 6 ft. high by 5 ft. wide, where the main steam lines run through. These lines consist of a 1¼ in. line for 250 lb. pressure, a 8 in. line for 150 lb. pressure, and a 6 in. return line, besides a water main line. All the steam lines are welded, the 1¼ in., 250 lb. line containing 11 expansion loops formed in a complete circular run. The 8 in. line contains 3 sliding expansion joints. Likewise the 6 in. line contains 3 sliding expansion joints. At different places in the main, nozzles have been welded in to take care of the main runs to the various buildings. The buildings served include a modern up-to-date Dairy, Cow Barn, Cow Clinic, Armory, Gymnasium, Fire Hall, Machine Shop, Pattern Shop, Carpenter Shop, Chemical Building, Engineering College, Arts and Science building, Administration building, the most modern of Greenhouses, which contain many valuable tropical plants and flowers, and finally, the Commons, where the meals for the students are prepared, and a score of other buildings such as Dormitories, Halls, Library, etc.

There are over 1600 students enrolled. This may help form an idea of the territory that is covered by feeding lines to the numerous buildings, required to take care of the needs, both mental and physical, of these students.

Another item of the new equipment is a very large tank installed for storage of chemically made gases. This tank is 42 ft. long, 12 ft. in diameter, weighs about 44 tons, and is all welded, the plate of the shell being 1 in. thick and the heads 1⅛ in. in thickness. All the connections in this are all welded and it has been built to withstand 600 lbs. pressure. The photographs give you an idea of the size of this tank. This tank and all the steam lines were acetylene welded and the smoke flue was electric welded, so that welding has occupied quite a part in this undertaking. Also, in the machine shop of the college students are taught fundamentals of acetylene welding in conjunction with their mechanical training.

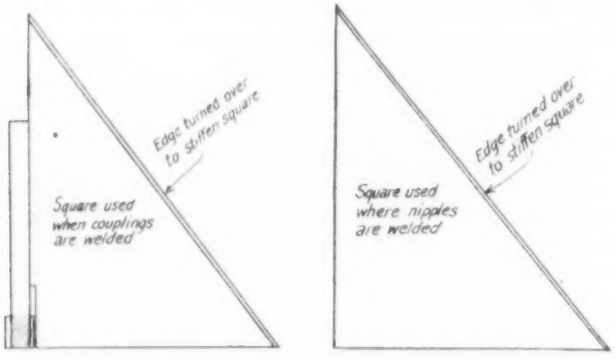


Upper Left: Large All Welded Tank for Chemically Made Gases. Lower Left: Smoke Flue, Patent Expansion Type, All Welded. Right: Views of the Power Plant and New Chemical Laboratory.

The welding of the 8 and 6-in. lines of pipe in the tunnel was accomplished by hoisting the pipe into the hangers and lining up, pitching and welding as many lengths together as possible and turning same with a chain tong. Where expansion joints occurred, Vanstone ends were welded on to the long lines and then bolted into place against the joint. This kept the lines faced while the welding proceeded.

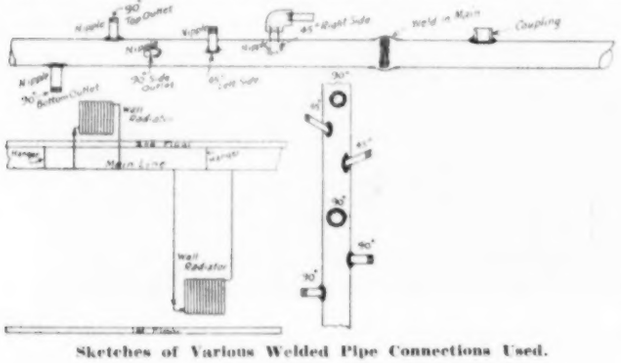
This is just one more step in the progressive march that welding is making in the building of modern industry. When a higher institution of learning sees fit to install a system that is welded it is giving hundreds of students an insight and knowledge of the process which they will carry out into their professional pursuits. Engineers trained here will have no doubts in their minds as to the possibilities and advantages of welding.

A new chemical laboratory was designed by three very capable chemical engineers and professors, and contains 85 rooms of various sizes. The construction of this building began in June, 1928, and will be completed for classes this fall. The heating system for this building is a forced hot water circulation system. It was installed during the winter and much severe weather was encountered while carrying it on; on two occasions it was as cold as 24 deg. below zero in the building, making it far from comfortable. All the connections taken off the mains for the radiators were cut in with a cutting torch and welded, doing away with tees, and eliminating


Edge turned over to stiffen square
Square used when couplings are welded
Edge turned over to stiffen square
Square used where nipples are welded
Made of 18 Gauge Galvanized Iron

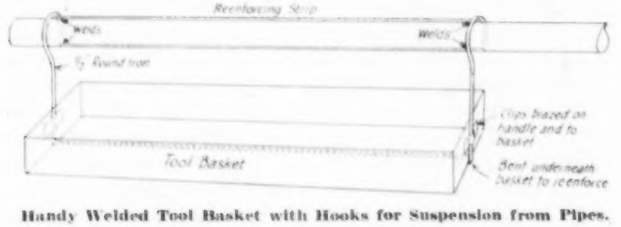
Method of Squaring Nipples

two joints (threaded) on every connection. There were 326 connections welded in this one building alone. A very good economical result is attained in this way, as it allows the pipers to run their main around the building without handling fittings and stopping to cut threads. In this way the mains are done up in no time. Each floor main takes care of two floors, some connections going up to radiators on the floor



Sketches of Various Welded Pipe Connections Used.

above and others to the radiators on the floor below. Nipples about 6 or 8 in. long are preferred and they are set to a given pitch and plumbed and welded. Those coming out on a 45 deg. turn are leveled by means of a 45 deg. ell and a piece of pipe. They are made plumb and square. Then the pipers plumb



Handy Welded Tool Basket with Hooks for Suspension from Pipes.

down through the sleeves in the floor and take their measurements and pipe up the radiators. It is quite surprising how many radiators can be hooked up in the course of a day on a job like this when each man handles his own particular task concerning the work of installation.

Much time was saved by using a tool basket made of galvanized iron to carry nipples, couplings, squares, level, hammer, chisel, plumb-bob and miscellaneous small tools. It can be hooked over the pipe and moved back and forth along the pipe at the workman's convenience.

[*Note: The author has welded many pipe installations in all parts of New England and has encountered all kinds of severe winter weather conditions. His experiences have demonstrated not only that pipe welding is not a "fair weather" job, but also that there is scarcely any type of pipe line which is not better welded than assembled in any other manner. Furthermore, Mr. Walker finds again and again that the exercise of a little ingenuity and common sense helps to make the welder's job more comfortable and to eliminate a great deal of waste effort and lost time—Editor.*]

STRUCTURAL WELDING IN THE CHICAGO DISTRICT.

At the November meeting of the American Welding Society, Chicago Section, which was held on the evening of November 7th, at Greer School of Automotive Engineering, 2024 S. Wabash Ave., Chicago, the subject of structural welding was brought closer to the local building and engineering fraternity by the discussion of some of the work which is actually going on in what may be termed the Chicago District.

Mr. J. J. Wallace, manager of the Joliet Engineering Company, Joliet, Illinois, presented a paper dealing with the economic importance of the welding process to the structural contractor. His paper was illustrated by slides showing some of the work which has been done by his firm, this work ranging from small ornamental iron work such as gates and railings to 96-foot trusses. Mr. Wallace's paper showed how the structural contractor can start welding in a small way by applying the process to a great number of miscellaneous types of construction in which the safety factor is not a prime consideration and the economy factor makes welding a very attractive method of assembly for the purchaser; and gradually work up from these beginnings to a considerable volume of business in structural welding.

Following this talk a paper was read by Mr. A. L. Wilson, of the Mississippi Valley Structural Steel Company, Melrose Park, Ill., entitled "Four Years Experience in Structural Welding." Mr. Wilson called attention to the importance of cooperation between the man and the job and the man in the drafting room. He also pointed out that it was necessary when figuring on structural work to determine just what part should be welded and what part should be riveted in order to get the best results from the standpoint of both strength and economy, and urged upon all those present the importance of remembering that welding will make faster progress if all of its applications are uniformly successful. He showed comparative welded and riveted designs and discussed their differences. He also pointed out some important points in designing structures for welding. This was followed by a description of methods of building up a satisfactory welding personnel and of testing finished work for quality. His talk brought out a number of points of great practical value to structural engineers who are interested in increasing their use of the welding processes.

Concluding the program was a demonstration by Mr. Rohder of the C. H. Hollup Corp. to show the effect of magnetism in arc welding. It was clearly shown that magnetic conditions can make good welding practically impossible and the demonstration showed how a few typical conditions can be corrected by a proper arrangement of the apparatus so that the welding procedure becomes normal in every respect.

Demonstrations of fundamental principles of welding procedure continue to arouse interest in the Chicago District. The membership of the Chicago Section is growing rapidly and it is thought that one reason for it is the apreciation of the great practical value of the monthly meetings to these men.

Welding Copper and Its Alloys*

Basic Principles of Successful Welding—Welding Tests on Copper of Various Grades by Different Welding Processes

By Ira T. Hook†

In Two Parts—Part II

Hardening Copper—Welding Characteristics

A great variety of vessels used in the chemical and food preparation industries and for pressure tanks of one sort and another, require greater strength than can be obtained in copper. With the advent of the silico-manganese copper and silicide hardening copper, we have available two alloys which have much higher cast strength than electrolytic or deoxidized copper and which can be used in the same thickness ordinarily specified for steel. They can also be work-hardened to much higher strength than copper, and their welding characteristics are decidedly better than those of copper.

The welding characteristics have been more thoroughly worked out in the case of the silicon manganese copper than in the case of the nickel silicon copper. The following series of tests bring out these features as follows:

Series 5: Tests to determine procedure with the oxy-acetylene welding torch. Borax flux.

Welding Rod	Base Metal, Approx.	Size Tested, Inch	Tensile Strength per Sq. In., Lbs.	Remarks
3.00 Si. 1.00 Mn. 95.00 Cu.	3.00 Si. 1.00 Mn. 96.00 Cu.	.264 × .626	43,060	Reducing flame. White cone 2 in. long, total length 14 in., intolerably slow. .55 in. of weld per min. Fractures in welds.
Ditto	Ditto	.261 × .626	39,600	Neutral flame. White cone ½ in. long, total length 7 in. 1.47 in. of weld per min. Fractures in weld.
Ditto	Ditto	.272 × .630	46,900	Flame severely oxidizing cone ⅜ in. long, flame 5 in. long. Steel would be badly burned in this flame. Speed 2.1 in. of weld per min.

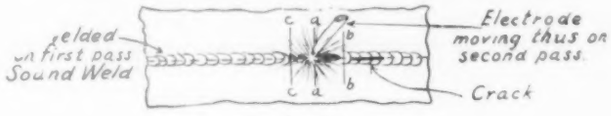
From this series, it seems safe to conclude that the oxidizing flame is the economical one to use. The reason for this is that we get a much greater concentration of heat than with the neutral flame, while at the same time the excess oxygen does no harm as it would with steel or bronze. The molten metal is protected by a thin coating of silica glass which spreads evenly over the metal in an impervious layer. As the metal cools and shrinks, a high compressive stress is put in this thin blanket of silicon and it flakes off with some violence leaving a smooth surfaced head.

To the welder familiar with the flowing properties of low carbon steel, this silicon-manganese copper would seem to flow marvelously free. Under the torch or the arc, it flows like water and will lie quiet under its protecting sheet of silica, even in the full blaze of the electric arc. It has, however, one weakness which must be guarded against, it is hot short in the recrystallizing-temperature range just below its melting point. Thus as the metal cools down from the molten to the solid state, precaution must be taken to avoid tensile stresses. Also since selective freezing is a function of time, we should hasten the cooling through this range the maximum extent. The advantage of a high concentration of heat over as small an area as possible is at once apparent.

The same precautions should be taken in the welding of the nickel-silicon copper alloy.

For a similar reason the seam should be completely welded in one pass. A second pass is followed by a crack and the weld is worthless. The explanation for this difficulty may be stated thus, reference to Figure 3 being noted.

In this sketch the weld has been completed and an attempt is being made to smooth and reenforce it with a second pass of the electrode moving from right to left. The region a . . a is molten, c . . c is cold and rigid, b . . b is in the hot short range just below the freezing point. The heat is running out-



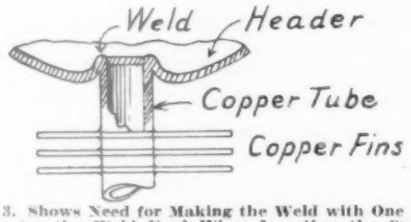


Fig. 3. Shows Need for Making the Weld with One Pass.
Fig. 4. Indicates the Weld Used When Inserting the Copper Tube in the Header.

ward from "a" causing the metal to expand. Since it is rigid at "c" and molten at "a," the seam tends to open scissor wise about "c" as a pivot. The ultimate result, therefore, is a crack following the electrode and the weld is useless.

If it be necessary to go over a seam the second time, it can be accomplished without danger by preheating the sheet on either side of the seam just ahead of the electrode. Most of the expansion will then take place before fusion and while the preheat will delay the freezing slightly at b. b., the section is likely to be in compression instead of tension.

Series 6: Tests to determine strength obtainable with the arc.

Welding Rod	Base Metal	Size Tested, Inch	Tensile Strength* per Sq. In., Lbs.	Remarks
Silicon - Mang. - Copper ⅛ in. dia.	Silicon-Mang.-Copper	.253 × .628	42,300	Metal arc. Reversed polarity. 170 amp. Fractures in weld metal.
Ditto	Ditto	.252 × .629	36,880	Carbon arc. Straight polarity. 170 amp. Fractures in weld metal; weakened by blowholes.
Ditto	Ditto	.112 × .632	48,460	Ditto, except weld metal quite dense.

While this series shows a fair strength, the fact that these were the first welds of this nature made by the operator leads one to a confident conclusion that were he to practice for several days on the technique, he would make welds which would consistently develop 45,000 lbs. per square inch or better.

Series 7: Resistance welds on .028" thick silicon-manganese-copper sheet were made in a continuous spot or seam welder. The two pieces of sheet were overlapped .21". The average tensile strength developed in the sheet by a pull across the seam was 49,350 lbs. per square inch with the fractures occurring in the original sheet adjacent to the weld.

*Paper presented at Fall Meeting, A. W. S., Cleveland, September, 1929.
†Testing Engineer for the American Brass Company.

Series 8: Welds made on steel as a base metal using the silicon-manganese copper as a weld rod. Flux in all cases consisted of a mixture of 90% fused powdered borax, and 10% Sodium fluoride, used dry.

Welding Rod	Base Metal	Size Tested, Inch	Tensile Strength per Sq. In., Lbs.	Remarks
1/8 Si.-Mn.-Cu.	½x1 in. Steel	.483 × .799	13,800	Oxy-acetylene welds. Poor adherence to steel due to formation of silicate layer on contact surface.
Ditto	Ditto	.485 × .697	17,030	Ditto.
Ditto	Ditto	.494 × .858	30,840	Oxy-acetylene welds. Base steel brought to bright red and rod melted quickly as in metal arc work, melting end or rod rubbed on steel to break up silicate coating. 42 per cent of fracture failing in adherence to the steel and 58 per cent in added metal.
1/8 Si.-Mn.-Cu.	Ditto	.506 × .787	39,870	Metal arc. Reversed polarity. 120 amp. Good adherence to steel. 72 per cent of fracture in added metal.

This series shows that in oxy-acetylene welding of steel with silicon-manganese copper rod, unless precautions are taken to break up the silicate coating between the added metal and the steel base, the bond will be of low strength and the edded metal will fail in adherence to the steel.

Where the added metal is deposited quickly, however, as with the metal arc or on thin sheet steel with the oxy-acetylene torch an excellent strength is obtained.

Welding Procedure

As the writer understands it, a workable procedure control is necessary to insure sound welds and this scheme involves a careful supervision of the four indispensable features, men, materials, methods and inspection. It is a difficult matter to lay down an accurate procedure control, that will apply equally well to a plumbing concern which is interested principally in welding pipe; a sheet metal shop using 14 to 26 ounce metal, a boiler shop using thicker and heavier sheet or a foundry specializing in casting. However, there are general principles, a concise statement of which follows:

Men. Expert welders are essential to the successful welding of high copper alloys. Unfortunately, we have expert welders who are merely expert steel on steel, metal-arc men; others who are merely expert oxy-acetylene torch men; others who are only expert welding machine operators. But to be successfully expert with the copper alloys, the welder should be equally experienced with the oxy-acetylene torch, the metal arc and the carbon arc. He should know what method to use on a given job, what flux to use, when a flux is needed, or when too much flux will make the metal porous.

He should know what welding rod to use with a given base metal and the condition of flame or current flow that will give the best results. In short he should combine high degree of manual skill with a reasonable mental versatility including a fair proportion of horse sense.

Materials. The base materials are usually determined on the basis of cost, desirability on account of its physical or electrical properties, etc., and neither the welder, nor the welding supervisor has much to say about it. However, it is important for the executive, the designer and the welder to get together before the base material is decided upon, as it is for the executive and the designer to consider the problems of the fabricator of a new structure or machine. It would be just as improper for the designer to specify a base metal weldable with difficulty for a job where welding would be the logical method of connection as it would be to specify an incorrect design of a riveted joint.

In the case of the welding rod or the deposited metal, the welder should have even more to say. He should, in the case of the high copper alloys, use a rod that will:

(a) Weld avidly with the base metal at
(b) The lowest heat to
(c) Yield the desired strength and
(d) Resist corrosion or change under the conditions that the assembly is to be used.

The welder who is skilled only in the welding of steel would probably insist that "penetration" is an essential but the versatile welder described above knows that if there is perfect alloying action along the contact surface, he has the best weld possible.

The welding rods which are most appropriate for high copper alloy base metals are as follows:

(1) **High strength yellow bronzes.** This class includes Tobin Bronze, Manganese bronze and similar compositions sold under various trade names. These welding rods melt at the lowest temperature of any rods above the silver solder class. In no case is it necessary to fuse the base metal.

These rods should be given first consideration as they have a higher strength than the base metal and use a lower amount of heat. They would be ruled out (a) where the electric arc is to be used, (b) where the difference in color is objectionable and (c) should not be used with a high copper base metal where exposed to an open flame or immersed in acid solutions.

(2) **Deoxidized copper.** These rods can be used with any method of welding. A fusion weld is the result, having the strength of dead soft copper only. The rod should carry sufficient deoxidizer to react with the oxygen during the deposition. Silicon is the best all around deoxidizer for welding.

(3) **Hardened Copper.** The writer is in favor of adding more of the deoxidizer as an alloying element and obtain thereby thorough deoxidization, greater strength, lower melting point and better welding characteristics generally. For this purpose the alloy carrying 3% silicon, 1% manganese and 96% copper is recommended but as is shown in the foregoing, other similar alloys can be employed.

Methods. Little can be said concerning the proper welding procedure except as it applies to a given job. The possibilities of the various methods have been discussed in the foregoing.

Inspection. As in pipe line welding where the work of the operators is periodically checked by test samples, the work of the welders on non-ferrous work should be periodically inspected for strength and quality.

Applications

In closing this discussion on the welding of high copper alloys a word on typical applications is not out of place.

In the electrical industry the welding of high copper alloys has found its greatest utility in connecting rotor bars to the end rings in induction and synchronous motors.

Silicon-manganese-copper is non-magnetic. This, together with the ease with which it can be formed, welded and fabricated, makes its use economical and suitable for the construction of electrical equipment requiring non-magnetic material with a strength equivalent to that of steel. Housings, barriers, panels and domes for circuit breakers and similar switch gear apparatus where the current volume is too high to permit of the use of ordinary steel, are now fabricated from Everdur.

In some cases the entire metal structure within the magnetic field is made of Everdur and in others where the current volume is not so great, satisfactory results are obtained by welding Everdur inserts in ordinary steel to break the magnetic circuit.

Metal arc welding is usually employed in the construction of the above type of equipment. Everdur electrodes of the same composition as the material to be welded are used, together with a flux composed of 90% fused borax and 10% sodium fluoride.

Copper stands virtually alone where high heat conductivity is required. Silver is, of course, out of the question, because

of expense. For practical purposes, copper with 91% of the heat conductivity of pure silver is in a class by itself.

For the small highly efficient radiators used on airplanes and automobiles, copper or copper alloys have always been used. The evaporators and radiators of the small refrigerators are necessarily copper. And with the increase in luxury and engineering knowledge, the diminution in size of the American home with a rise in the cost of fuel during the past decade, there has come an increasing demand for the removal

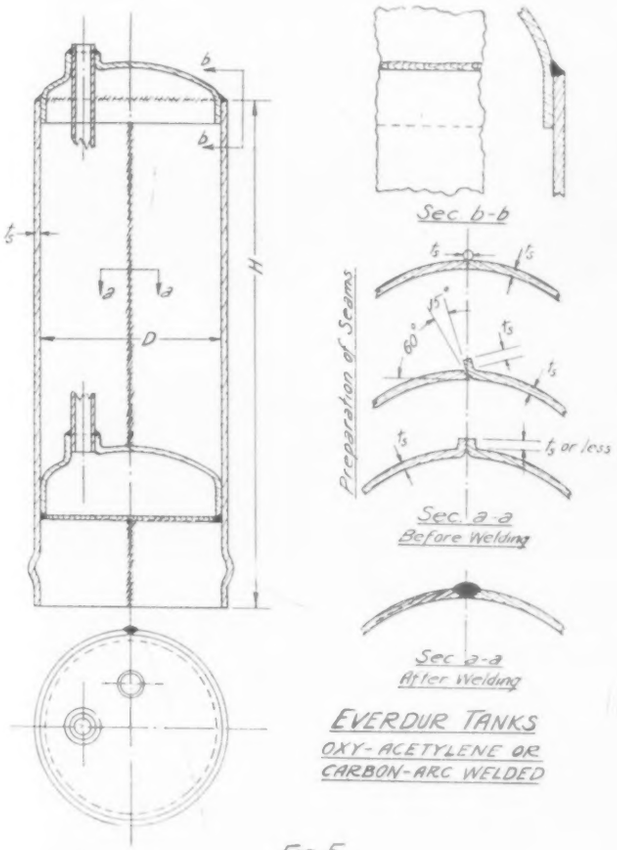


Fig. 5

of the clumsy iron household radiators and the substitution therefore of the compact, efficient copper radiator. It occupies but two-fifths of the space and weighs only one-fourth as much as a cast iron radiator. No less than thirty manufacturers have entered this field during the past several years.

There are likewise nearly as many different designs as there are manufacturers. And while it is beyond the scope of this paper to go into the merits of the different designs, there are a few things that may be pointed out. When this type of radiator was first projected, the designer went to extremely thin metal and immediately found himself in trouble. He may have followed the practice of the automobile radiator manufacturer whose radiators are operated on a head of only a few inches of water with a temperature rarely exceeding 200° F. On the other hand, those for houses and large buildings are frequently called upon to withstand city water pressures and sometimes a higher temperature than the boiling point of water. Hence instead of the soft solder dip used in automobile radiators, it was necessary to resort to welding (or brazing).

As these radiators are generally made now, the header sheet of somewhat thicker gage metal than the copper tube is pressed into shape for resisting pressure and the holes punched and rimmed to fit the tubes as indicated in Figure 4. They are then carbon arc welded. Carbon arc welding has proven successful for this purpose. The process used should be quick and cheap and introduces a minimum of heat during the welding process and minimizes warping caused by expansion and contraction.

If the tube plates and headers are made of a brass high in zinc, all that is needed is to moisten the ends of the tubes and sleeves with a damp cloth and sprinkle on boric acid from a salt shaker. Enough of the zinc is vaporized to deoxidize the air in contact with the molten weld metal and leave dense strong welds. But if the tube plates and headers are made of Red Brass or Commercial Bronze, there is not enough zinc in the brass to deoxidize the air in contact with the weld; so chemically pure powdered zinc is mixed with boric acid equal parts by weight and applied as above noted, and excellent welds are obtained with the carbon arc.

If EVERDUR is used for tube plates and headers, the flux of course should be the 90% fused borax with 10% sodium fluoride applied to the tube and sleeve ends as above noted and the welds made with the carbon arc. In all carbon arc welding, the polarity is the same as when welding steel with steel, that is, the work is the positive and the electrode the negative, but if metalic arc welding with copper alloy electrodes, it seems to bring better results in most cases to make the work the negative.

A further development in this type of radiator is to insert in the heating water circuit a refrigerating machine in which case the radiator becomes a cooler for summer use. Provision has to be made for draining off the condensation. Combinations of this sort will be available in a short time.

The last application to which I wish to invite your attention is where the hardened copper alloy is used for pressure vessel, evaporators, steam cookers, etc. Formerly, where copper was used for this purpose, it had to be both soldered and riveted.

The riveting seems to the writer as inefficient a way of connecting thin sheets of this sort as did the countless one-by-one stitches taken by the seamless before Elias Howe transferred their skill to his sewing machine.

The attached sketch Figure 5, shows a typical hot water container welded throughout. A single longitudinal carbon arc weld suffices for the shell and the preformed top and bottom are similarly welded. Cold rolled sheet may be used for the shell, the narrow heating path and the reenforcing of the bead largely discount the annealing effect of the weld. The top and bottom are made of slightly thicker metal. The entire tank is made of silicon-manganese copper, cast connectors of the same material being welded into place.

As a final word, the writer offers the thought that the process of welding will be just as useful a tool to the non-ferrous artisan as it has proven in the connection of iron and steel.

NEW BOOK ON PIPE WELDING

A 24-page booklet containing helpful and instructive information on the installation of Oxy-Acetylene Welded Piping for industrial uses and also for the heating of domestic and industrial buildings.

The first section considers the uses of Oxwelded piping in industrial plants, including piping for the transportation of oil, gas, chemicals, water, etc., and the second section deals mainly with piping for heating and heating systems. The widespread and ever increasing use of the oxy-acetylene process for welding piping should make this booklet in very great demand. Copies of this are available from The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., or from any of their 26 district sales offices which are located in the principal cities of the country.

WELDED OIL TANKER

By S. W. Fransson

Far back in the dim past, the ship-builder used the design of a raft hastily thrown together of perhaps driftwood—then came the canoe, the boat, the Viking ship, and so on until today, when we see ships go into shape in a most wonderful manner by spinning a wheel and leading an "energi" of the mystery through a cable in the hand of an operator, fusing the plates of the ship into one homogeneous shell.

The "Arc," one of our most wonderful servants, will do in an instant what all riveters in the world failed to do; namely, to make a tight joining.

It is proven, beyond a doubt, that a weld done properly is far superior to any rivet, and when the people have had a few more years' opportunity to watch the welded ships, welding will, undoubtedly supersede riveting entirely in ship construction.

The Truss-Weld Barge Corporation recently launched an 8,000-barrel capacity gasoline tanker that has not a rivet in its hull. All the plates are arc welded, including all foundations for engines, pumps and hatches.

This barge is 134 feet long, 33 feet wide and 12½ feet deep, and is divided into six tanks, each reinforced from all sides by a network of 3" channels and welded to the bottom sides and deck.

The two tanks aft, one on each side of the engine room, are intended to carry lubricating oil.

The barge has bottom plates of ½" plate with butt plates overlapping 2 inches and welded at both seams. The deck plates overlap 2 inches and are welded. The cabin is constructed by using steel plate and angles and then lined with wood.

The handling of gasoline is done by two Viking pumps driven by Novo 22 h. p. gasoline engines and connected to all the tank rooms by a 6" pipe line, thus making it possible to handle the load in less than 10 hours time.

The cabin, engine room and pump room are lighted by a Delco lighting plant, using a generating plant and batteries.

Blower type fans are used for ventilating all parts that would hold vapors.

A marine hand pump is connected to the bottom compartment of the engine room.

The openings to the tanks are covered by hatches with lugs, brackets, handles and packing rigs, all welded in.

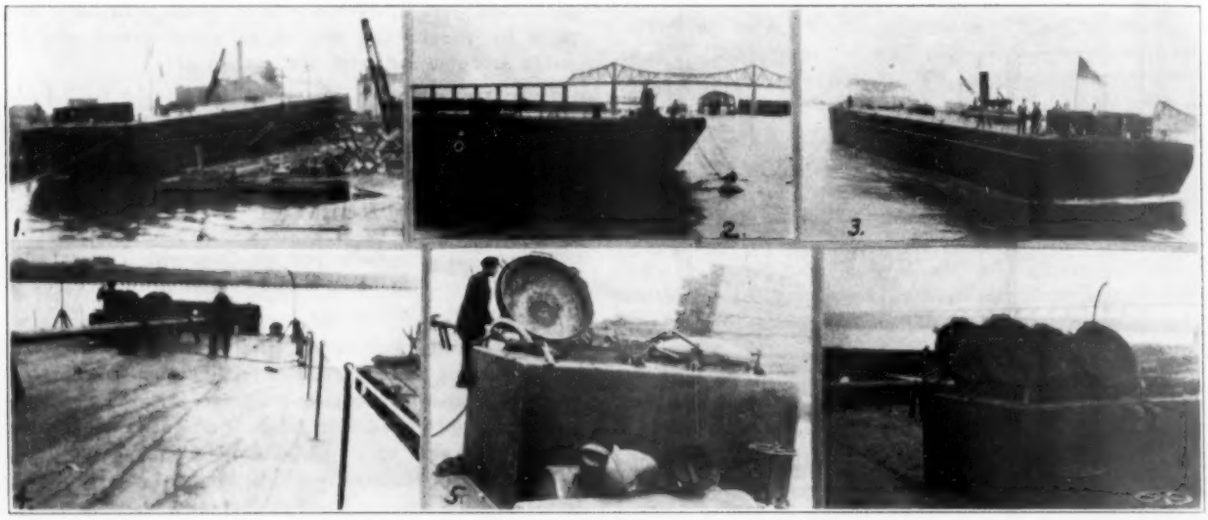
The ladders are made by bending ¾" round steel and welding the two ends to bulkheads.

The time of construction was about 60 days in which time about 14,000 feet of welding united this steel barge. Four Lincoln welders were used and were running nearly continuously.

The Acetylene torch was a constant service tool that was used in cutting, heating and bending.

In building the tanks and bulkheads the torch was the main resource as an adjusting tool.

This barge was built for A. R. Newcomb Oil Corporation, Kinston, New York.



No. 1. Shows the Barge Just Before Launching. No. 2. The Barge Moving Out Into the River. No. 3. Shows the Barge Being Towed to the Dock. No. 4. View Aft Toward Portside Showing Pipe Line, Deck House, and Construction of Railing. No. 5. The Forward Hatches and One of the Covers Open. Fig. 6. The Midship Hatches All Open, Also Showing the Valve Wheels and the Overflow Pipe.

CLEVELAND SECTION ENJOYS DR. LANGMUIR ON PHOTOPHONE

The largest meeting, from the point of attendance, ever held in the Cleveland Engineering Society rooms was staged Thursday evening, October 17, under the direction of the Cleveland section of the American Welding Society. The attendance, numbering 300, was made up of three groups, the A. I. E. E., the C. E. S. and the A. W. S. The occasion was the first Cleveland presentation of the new Portable Photophone projector perfected by the General Electric Company at Schenectady.

Dr. Irving Langmuir in this film shows how through research work Atomic Hydrogen Welding was introduced and made a commercially feasible welding process.

Preceding the film of the actual Atomic Hydrogen Welding a nationally known radio broadcaster played a piano and the tones reproduced from his piano were photographed by special apparatus and shown in what might be termed a graph, which, of course, synchronized with the film. This particular type of talkie movie, whether applied to industrial problems or for recreational purposes is entirely new, as the sound control is on the edge of the film, therefore making synchronization possible.

One particular value that this meeting held was the fact that Dr. Langmuir was probably seated at home enjoying himself and yet the 300 men in Cleveland saw him and heard him in a well equipped laboratory without the necessity of transporting bulky equipment to the meeting, and eliminated train fares and other expenses that would have to be incurred were he to appear personally. Every noise of the Atomic Arc could be clearly heard in this picture. Undoubtedly the introduction of this type of Photo Phone Picture opens up a new era in technical meetings.

Auto Body Welding*

Present Day Production Methods in Building All Steel Automobile Bodies Are Due to Perfection of Resistance Welding Processes

By J. W. Meadowcroft†

THE increase in the use of the lighter gage sheet metals during the past twenty years has been due in a large part to the progress which has been made in the development and application of the different methods of welding.

It has been proven conclusively that any of the methods of welding adopted as standard such as Arc, Spot, Gas or Flash, will produce results which are satisfactory and reliable and at a low cost. The older means of assembling sheet metal products by riveting is being gradually replaced by one of these more modern methods.

With welding as the basis of our present method of assembly, it is important that careful consideration be given to the adaptability of the particular type of welding which should be used and to certain other conditions which greatly influence this phase of the work.

The rate and duration of production should, perhaps, demand the greatest consideration. Successful high production demands simplicity of operation and low cost. From this it follows that the welding operations should not be encumbered by requiring highly skilled labor nor by complicated and unwieldy machines which would inevitably tend to lower the efficiency of manufacture.

Of equal importance is the necessity of having parts designed so that the welding and assembly operations may be properly carried out. The design should be simple and readily adaptable to one of the standard methods of welding. One of the great mistakes often made is to attempt to weld an article which was originally designed for riveting without first considering whether or not advantageous changes might be made.

The proper selection of materials to be used is also of great importance and great care should be exercised to bring about the desired results. If a definite property such as, for example, strength or flexibility is the ultimate purpose, emphasis should be laid on the materials together with the correct design in order to obtain the particular object in view.

Some twenty years ago when the company with which I am associated was formed to manufacture automobile bodies, we were faced with the problem of deciding what methods of

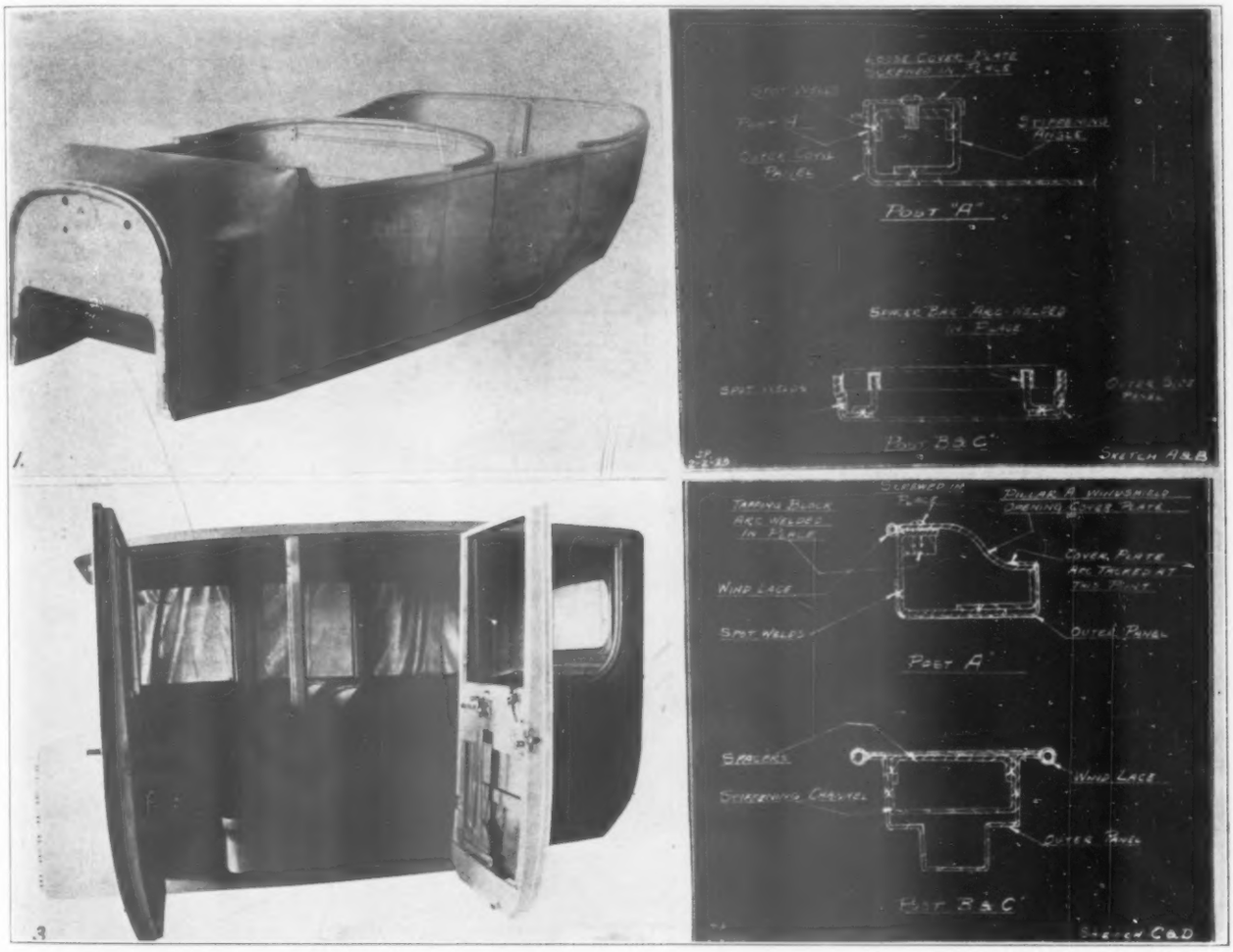


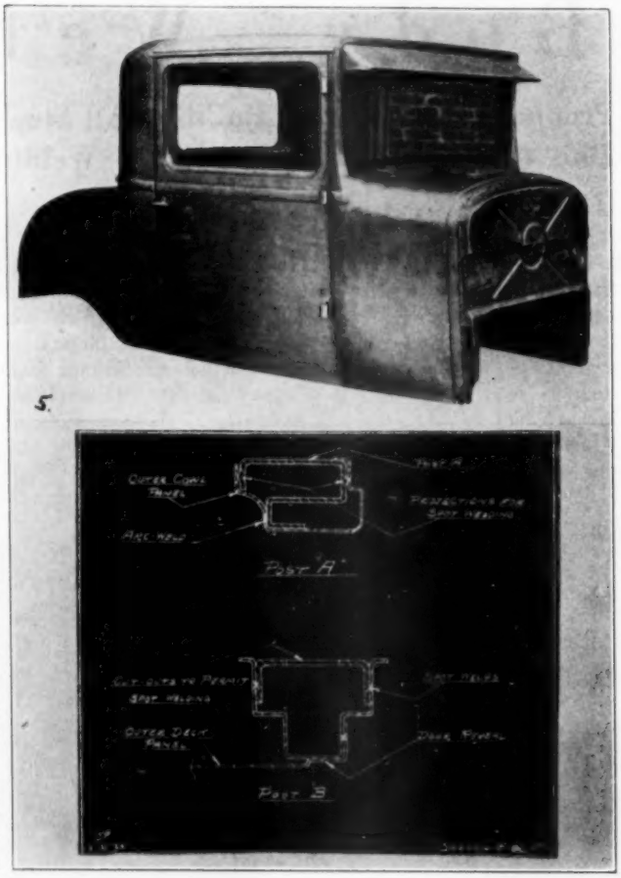
Fig. 1. One of the Early Touring Car Bodies. Fig. 2. Cross Section of the Post Construction in the Touring Car. Fig. 3. First All Steel Closed Body Produced. Fig. 4. Sketch of Pillar Post Construction of This Closed Body.

*Presented at the World Engineering Congress, Tokio, Japan, Oct. 30, 1929.

†Assistant Works Manager, Edward G. Budd Mfg. Co., Philadelphia, Pa.

fabrication and assembly would produce the best results. With the conception of the All-Steel automobile body we, as pioneers in this field, have been constantly developing and improving our methods of manufacture and increasing our knowledge of welding until they have reached their present high standard of excellence. At the same time we have been able to effect an increase in the efficiency of our operations by a considerable reduction in the cost of tools and welding equipment.

In our opinion spot and flash welding are the two types of welding that are most readily adaptable to the successful production of automobile bodies. These methods produce good, strong and reliable welds. They yield clean results and high rates of production may be maintained at low material and labor costs. In certain cases, however, some of the other types of welds are considered more efficacious. In the bodies which we now manufacture, all of the usual methods of welding are used except the thermit weld, which is not adaptable to sheet metal work.



In the early history of the company, the entire production was completely devoted to the production of the open-type body or touring car. A product of these earlier days is shown in Fig. 1. A cross section of the post construction of the type body may be seen in Fig. 2 (sketch A & B).

At this early date much stress was laid on a proper design for the use of the spot weld and from Fig. 2 it is readily noticeable that the flanges and overlapping edges of metal are of sufficient length and width to provide the greatest strength possible after spot welding. The amount of welding required in the production of this type body follows:

Electric Spot Welds	1000 to 1100
Oxy-Acetylene	70″ to 80″
Metallic Arc	10″ to 12″

After many years of experimenting the first closed body of all steel was produced and this earlier design is shown in Fig. 3. The Pillar Post construction is shown in Fig. 4. It may

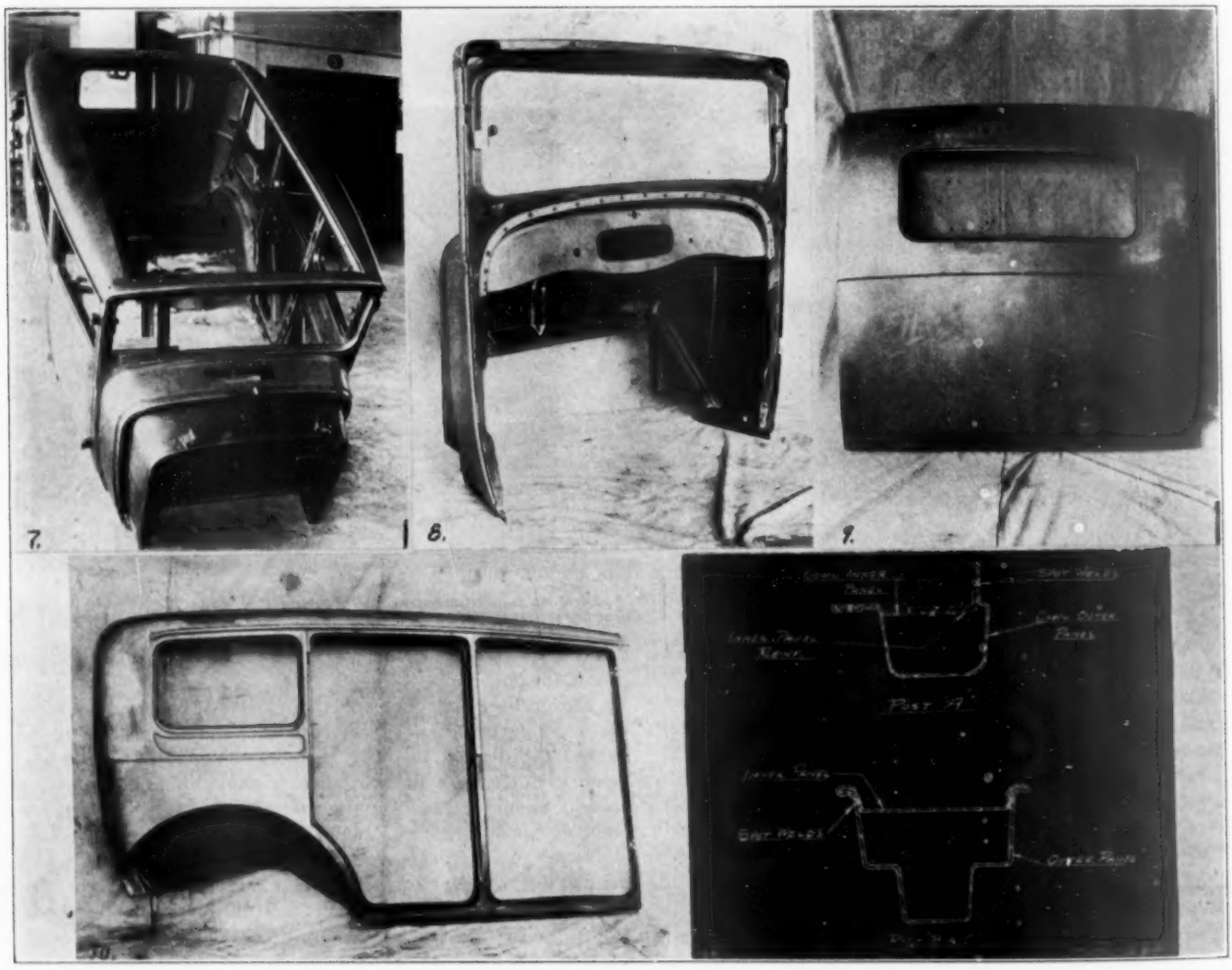


Fig. 5. Outside Design of Newer Type of Closed Body. Fig. 6. Cross Sectional Design of the Pillar Post. Fig. 7. Appearance of the New Steel Sedan Body Structure. Figs. 8, 9, and 10. The Major Units Before the Final Assembly. Fig. 11. Shows Sketch of Assembly of Posts.

be seen in Fig. 4 that the entire design is developed so as to allow easy access of the copper spot welding tool. Although the tools are of many different designs the clearance allowed by the design of the section is such that the tool has sufficient strength and at the same time permits the operator to make welds of maximum strength and clean appearance.

From this point of further improvement in design was made with the idea of using welding as the sole means of assembling. Many difficult problems arose which appeared to be unsurpassable from a welding standpoint. Fig. 5 shows the outside appearance of this newer design while Fig. 6 (Sketch E & F) gives the cross sectional design of the pillar posts A and B.

the entire outer side panel formed from one large sheet of metal, which is reinforced by an inner panel which is also produced from one great sheet. The same general principle of construction is followed on all other unit parts including the cowl and the doors. The edges of the inner panel and outer panels are spot welded and clinched.

Fig. 11 (Sketch G & H) represents the detail assembly of Pillar Post A and B & C Post and shows the inner panels located in the outer panel, the location of the spot welds and interlocking clinched flanges. In this type construction the major parts have been reduced from 300 to 17. It is clear that such a reduction in parts further obviates any tendency to develop squeaks and rattles and results in a body which is

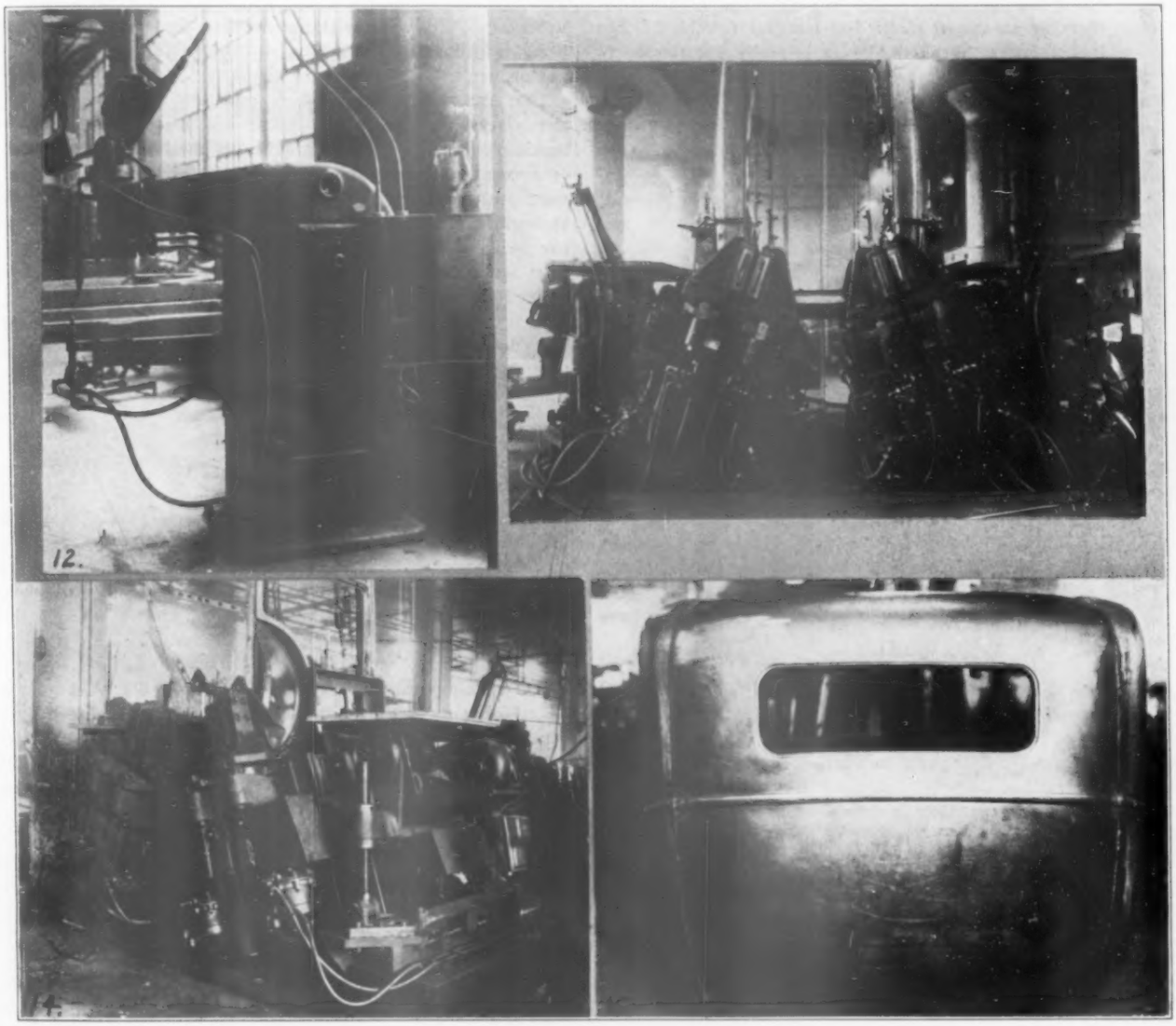


Fig. 12. Shows a Standard Spot Welding Machine Used in this Work. Fig. 13 and 14. Views of the Flash Welding Machine with Tonneau Back and Side Panels in Position for Welding.

Fig. 15. This Shows the Side and Rear Panels After Being Flash Welded Into One Unit.

This closed body was termed the "Full-Vision Body" on account of the small and compact sections which afforded much greater vision from all angles by the occupant of the car. The posts of this construction have four times the strength of wooden pillars.

New Designs in All Steel Bodies

A new type of construction represents an interesting development in automobile body building. It represents an achievement not only in the art of forming large stampings but also in its strength and roominess.

Fig. 7 gives the outside appearance of the new structure while in Fig. 8, Fig. 9 and Fig. 10, the four major parts or units are shown before the final assembly.

Fig. 10 represents the side panel construction and shows

much stronger and very much more rigid.

This new construction requires the following amount of welding for each complete job:

Spot Welds	125
Gas Weld	42"
Metallic Arc Weld	4"
Electric Flash Weld	216"

Standard Welding Equipment Makes the Production of Large Stampings Possible

Due to the large size of this new type of stamping, the problem of handling during the welding and assembly operations had to be solved. But the flexibility of the welding machine is such that it lends itself readily to the changes which

had to be made. Overhead conveyor equipment was designed and constructed so that the stampings can easily be brought into position at the working head of the machine.

Fig. 12 shows the standard spot welding machine. This type of machine can be operated either by hand, foot or power according to the exigencies of the particular operation.

In the assembly of the four major units, the right and left hand units are placed in a large flash welding machine. Fig. 13 shows the flash welding machine, front view, with tonneau back and side panels in position for welding, and Fig. 14 gives the side and back view of the same machine. In this machine the side and rear panels are flash welded into a unit, as shown in Fig. 15. The piece is then placed in another jig (the roof opening being correctly aligned) and the cowl is attached, first by means of rivets and later spot welded. The product after leaving the assembly jig is ready for the doors and final finish. Both of these operations are produced on line conveyors.

There are two types of automobile bodies in use today. One type is known as the composite body. The other is the all-steel.

The composite body consists of a frame work of wood; hundreds of wooden parts, glued and screwed together, and covered with a shell of light sheet steel.

As its name implies, the All-Steel Body is All Steel. The interior frame and the exterior covering are electrically and oxy-acetylene welded into a single, compact unit of resilient steel.

The All Steel body is safe. If accident should occur, steel—sturdy, shock resisting—interposes between the passenger and possible injury. There are no wooden parts—varying in strength—to give way and shatter under impact—to work loose and break.

Such a body is safe to drive because the great strength of steel permits the use of narrow pillar posts, resulting in less than half as much obstruction to driving vision as bulky wooden pillar posts. It is possible for the driver to see all the road and every approaching pedestrian and car. This tends to avoid those accidents for which bulky pillar posts have often been held responsible.

Not only the front pillar posts, but all the uprights, are of slender steel construction—allowing more light, more air and greater vision for all the occupants.

Steel automobile bodies are quiet—with the quietness of one piece of steel, no wooden parts to warp or work loose, causing squeaks and rattles.

The All-Steel construction is durable. Being steel, it lasts long, and depreciates very slowly, and its sturdy construction gives to the driver and occupants alike, the same safe feeling which is enjoyed by the occupant of today's modern All-Steel railway coach.

MANUFACTURING WELDED PIPE

By C. J. Holslag, Electric Arc Cutting & Welding Co.

There are so many different methods of producing large diameter pipe with a welded longitudinal seam that the term "welded pipe" now has to carry some additional descriptive term in order to make it specific. Among the different processes there is first the blacksmith weld, that is, the hammer weld or the common pipe weld, which is made by many of the mills in the eastern steel districts. I would like to mention in passing that tests made of this type of weld in comparison with arc welding and gas welding indicate that the blacksmith weld seems to be a great deal overestimated. This is especially true as the material increases in thickness. When the thickness is about ½ inch it is usually found that the scarf is burned or the center is not well joined. For example, there was a time when we had a great many air receivers to make up which were being insured. The insurance people suggested that we use pipes, so that there would be no question regarding the longitudinal seam. However, when we tested the arc welded head seams the longitudinal seams invariably spread, so that the arc welding was resorted to on the longitudinal seams in order to have a uniform product.

Next, historically, comes the oxy-acetylene welding process and it is my opinion, based on experience, that for this work oxy-acetylene welding give the best results which have yet been developed. But, because of its greater cost it does not seem to be enough better, especially on the larger sizes, to warrant its use on a production basis. Apparently the reason for the better quality of work done by gas welding is that most of the bubbles are worked to the surface, whereas when the arc is used there is not sufficient pressure to squeeze out the bubbles and the weld is liable to be more porous than a gas weld. The latter type of weld also shows greater ductility, which is undoubtedly due to preheating of the metal, which is necessary. Electric resistance welding is not subject to bubbling if proper pressure is used, but so far the pressure has not proven to be practical for the larger sizes of pipe.

The arc welding method is commercially practical up to any size or thickness and there are several firms who are making pipe by arc welding, both by hand and with automatic equipment. Either the carbon arc or the metallic arc can be used and a merry war is going on as to the merits of each system. In the metallic arc single, double or triple outside beads can be employed and each system has its boosters, but the results are about the same. The users of arc welding can also be divided into two groups on another subject. There are those who try to secure a weld as ductile as possible and also those who deliberately make the joint stiff so that the stresses are transmitted to the sheet. Experience leads me to think that the stiff joint is the much more practical one. The most outstanding use of it here in the East on pipe work is in the plant of the Walsh Boiler Works, Holyoke, Mass.

An example of the use of ductile joint is found in the penstock pipe made by the A. O. Smith Corporation, Milwaukee, Wis., and also the products made by the Quasi-Arc process. My criticism of the ductile method is that if the section is not made greater, there is very much danger of failure occurring in the welded section, since no fusion weld, by any process, can equal a rolled plate. Now, if the ductile weld is made of greater section and hence greater stiffness, it might just as well be made stiff without the attempt at ductility.

Gas welding ordinarily makes a more ductile weld than any arc welding method except the more recently developed hydrogen flame or shielded arc. This hydrogen flame has not reached a stage of development where a large pipe is being made with it. It is interesting to note that it makes a weld which is distinctive for is ductility, purity and soundness.

Electric resistance welding when great pressure is applied makes a very good pipe welding and small pipes manufactured by that process are becoming extremely popular in the field on account of the combination of good quality and better pipe. While it would be theoretically possible to make large pipe by this process, serious practical handicaps are in the way of such development. However, recent developments in arc welded pipe have inspired the resistance people to greater endeavor and if enough profit is forthcoming the resistance welded product pretty generally comes to the front in mass production.

OIL MAN MAKES CLOSE GUESS ON WELD TESTS

From a report received of the prizes awarded in the guessing contest staged at the booth of the Linde Air Products Company during the International Petroleum Exposition at Tulsa, Oklahoma, last month, it is noted that the grand prize of fifty dollars was won by Mr. W. C. Stegner of the Mid-Continent Petroleum Company. This prize was offered for the best guess as to the average tensile strength of forty coupons that were tested during the exposition. The average strength was 52,328.7 lbs. per sq. in., and Mr. Stegner's guess was 52,328.3 lbs. per sq. in. The daily average of five coupons, over a period of eight days, ranged from 49,942.4 to 53,979.5.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

ARC WELDED BALANCING MACHINE

By George T. Kerr
McIntyre & Kerr, Berkeley, Calif.

The motor Fig. 1. is a 7 1/2-inch bore x 9-inch stroke Hall-Scott Engine, designed primarily for gas-electric drive in railroad work, although suitable for stationary or marine service. This engine develops 350 H. P. at 1,000 R.P.M. and is carefully and accurately built. Before welded parts were incorporated in the design they were subjected to rigid tests before being accepted.

Fig. 1. The Hall-Scott Engine Which Contains Numerous Welded Parts.

There are many pipes and other parts, welded or brazed, assembled to the engine.

The Crank shaft, Fig. 2, is an alloy steel heat treated forging. The counterweights are held on by studs screwed into the crank shaft and nuts tightened down on the counterweight. The nuts are then arc welded to the studs and to the counterweights, making one complete unit.

In connection with the crank shaft, it is necessary to dynamically balance it. As this piece weighs 1,000 pounds and is approximately 6 feet long, the machines used for balancing the smaller engine shafts were too small, so we built a larger machine, cutting out the various parts with a cutting torch and arc welded them together, shown at Fig. 3.

These pieces were normalized before machining to remove welding strains. Fig. 2 shows the machine as built with a crankshaft in place. The action of the machine is as follows: A crankshaft is mounted on the machine, it is supported at each end on four rollers. An extra set is seen at extreme left, Fig. 2. A belt is connected between the center main bearing and the drive shaft. An air motor is used to rotate the shaft. This motor gives a very flexible drive from a few R.P.M. to 1,000 R.P.M., the speed at which the shaft is tested for balance. If the shaft does not balance it will oscillate back and forth when rotated, provision being made for this motion in the roller carriers. The places out of balance are ground away until the shaft runs without vibration at 1,000 R.P.M.

As there is considerable vibration when this machine is used the welded parts must be heavy and the welding must be well done. The machine has functioned perfectly so far and is expected to continue doing so.

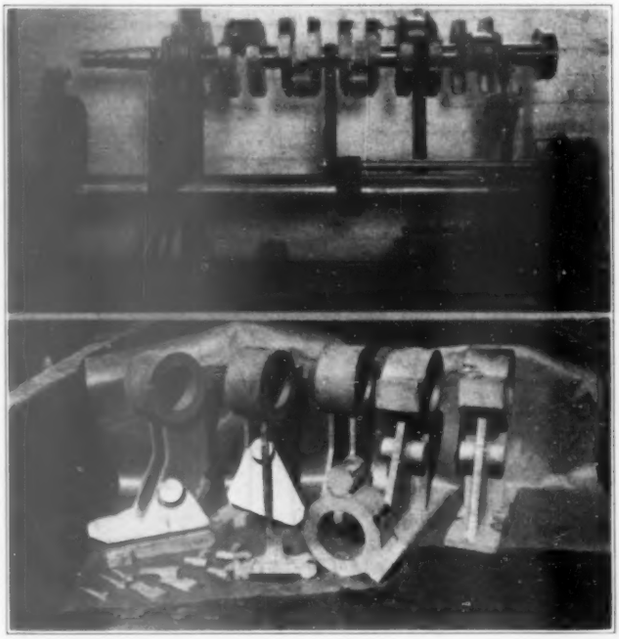


Fig. 2. The Welded Balancing Machine with the Crank Shaft in Place for Testing.
Fig. 3. This Shows Parts of the Balancing Machine as Cut and Welded Up from the Steel.

SUGGESTIONS FOR THE JOB WELDER

By T. M. Bridges

There is no one thing which will be of more help to an arc welder as a time saver than some arrangement for keeping his supply of electrodes within easy reach. There is no excuse for just dropping a bundle of wire on the floor near the job when it is such an easy matter to make a convenient holder. The holder illustrated in Fig. 1 has the double advantage that it can either be set on the floor or hung from a nail or a hook. It can be made by welding two 9-in. lengths of 1¼-in. pipe to a suitable base of 10 gauge iron. The hook and handle are made of quarter-inch rod and welded to the holder. When a welder is doing production work it is a good idea to have a definite place for keeping the electrode holder while work on the welding bench is being moved or changed. Fig. 2 shows a simple fork made of quarter-inch square stock, heated and bent to shape and welded to the underside of the table. This keeps the electrode holder within easy reach of the operator and saves a great loss of motion. If the holder is different from the one shown in the sketch it may be necessary to cover

the fork with some insulating material, but this is very easily done.

When laying out the work and getting it ready for welding, the operator often looks around for something to use for a small wedge. It is the work of only a few seconds to heat

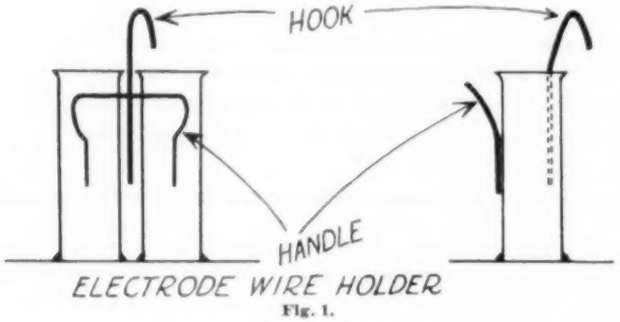


Fig. 1.

the end of an electrode stub, hammering it flat on one end, making a small wedge which comes in real handy on a lot of jobs. It often happens that when welding up tanks and hoppers of odd shades, the welder finds it difficult to tie the edges of sheets together. Fig. 3 shows how to use a flat bar, a couple of clamps and some small wedges effectively for this purpose and practice. Each end of the joint is welded, then the bar is clamped at each end, being placed outside along the

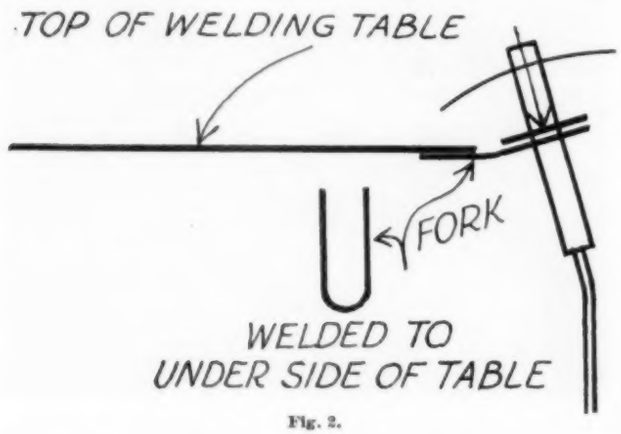


Fig. 2.

joint as shown, then by driving the wedges between the number and the sheet it is easy to bring the two pieces together in a position for welding.

When welding on a job where it is necessary to stand on the object being welded, it is a good plan to have on hand a

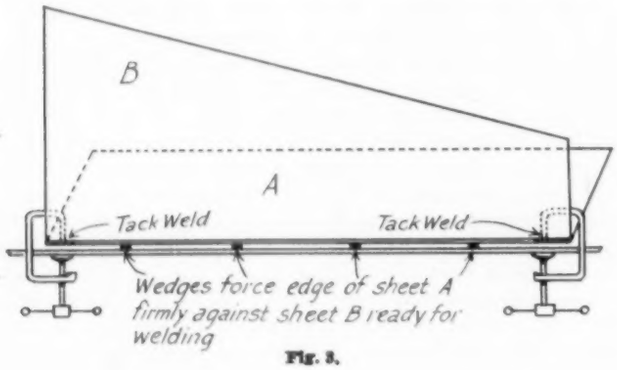


Fig. 3.

piece of Celotex to act as an insulator, particularly if the work is damp or wet.

When the vertical weld gets difficult, try starting at the top and hold the electrode perpendicular to the line of weld; when welding in this manner you can easily see just what you are doing and have a good check on the penetration, because if you work in this direction any failure to get penetration will result in the metal falling away instead of going into the weld.

A cast iron plate 1½ in. thick and measuring about 18x24 in. will be found a very useful piece of equipment for the welding table. It should be perfectly flat and have its edges squared.

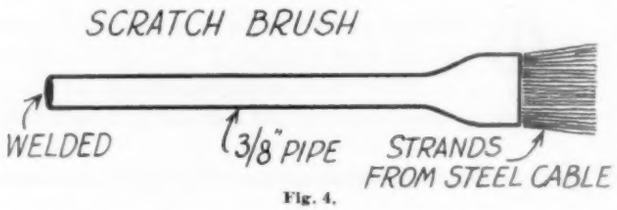


Fig. 4.

In the job shop such a plate makes it possible to do a good deal better job of laying out work.

In lots of close places the ordinary wire brush does not reach. A good scratch brush to get into the corners with can be made from a 6-in. length of ⅜-in. pipe with enough strands from a piece of steel cable to fill it; push the bunch of cable strands through the pipe and weld them into them; flatten the opposite end of the pipe and grind the strands to the desired length, as shown in Fig. 4.

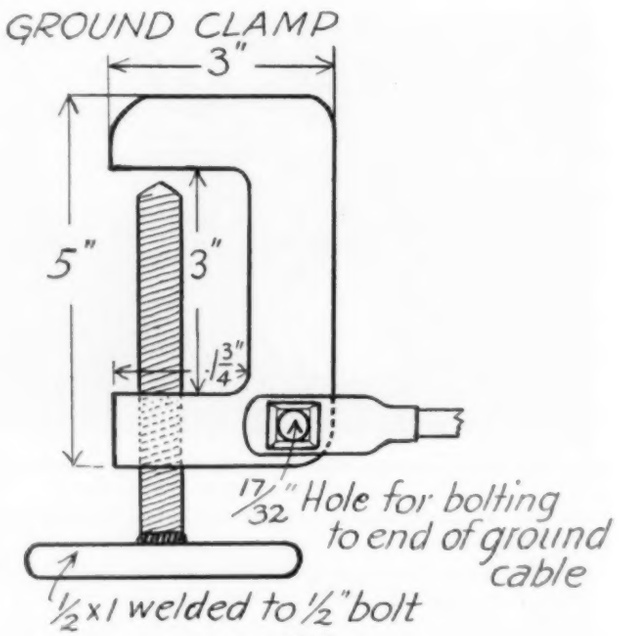


Fig. 5.

Fig. 5 shows a simple and effective ground clamp made from a piece of machine steel 1x3x5 in. It was roughened out with the torch and finished off on the shaper.

Recently a 4-in. crankshaft was brought in to be lengthened.

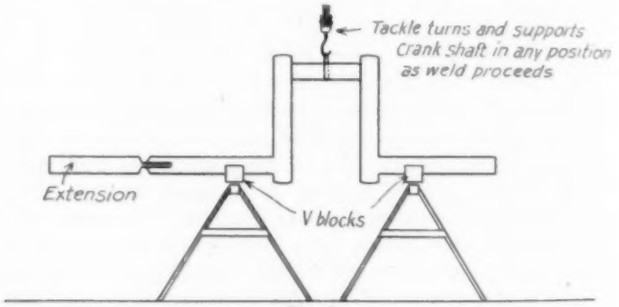


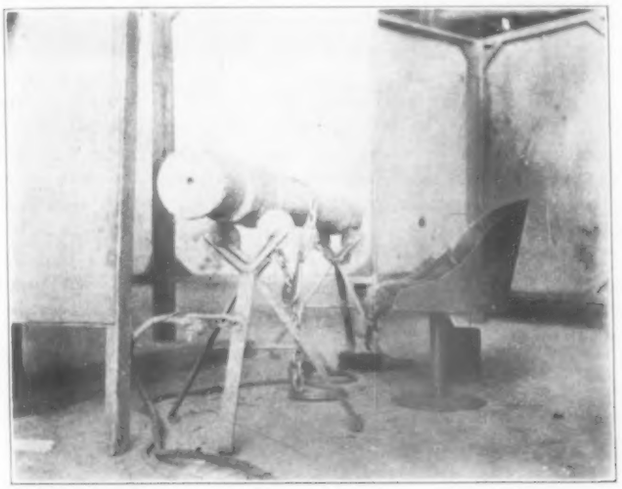
Fig. 6.

The end of the shaft was bored and threaded to a depth of 3 in., the hole being about 1⅛ in. in diameter, then a piece of 4¼-in. shaft, 3 in. longer than the extension required, was

turned down and threaded for 3 in. of its length and screwed into the end of the crankshaft. The ends of the extension and of the crankshaft were then beveled to about 30 deg. to prepare it for the welder. It was welded in about 3 hours and when it was machined the weld could hardly be detected. In making the weld each layer was peened and thoroughly brushed. Fig. 6 shows the set-up used for handling this work.

HANDY HORSES FOR THE WELDER
By J. C. Coyle

A pair of metal horses, like those seen here, will be found very useful in roll welding collars on car axles, and other round work. Three 24¾ in. by 2 in. straps, with the lower ends turned in for feet, are used as legs for the horse. These are welded together at the top, and cross braced about half



Welded Metal Horses with Rollers for Supporting Round Work.

way up. Two 12 in. sections of 1 in. square metal are bent into a V shape and welded to the top of the legs, about two inches apart. A second pair of V's, somewhat shorter, have a pair of ½ in. by 4 in. rollers bolted through each end, and fit in the top of the larger V, with the rollers projecting through.

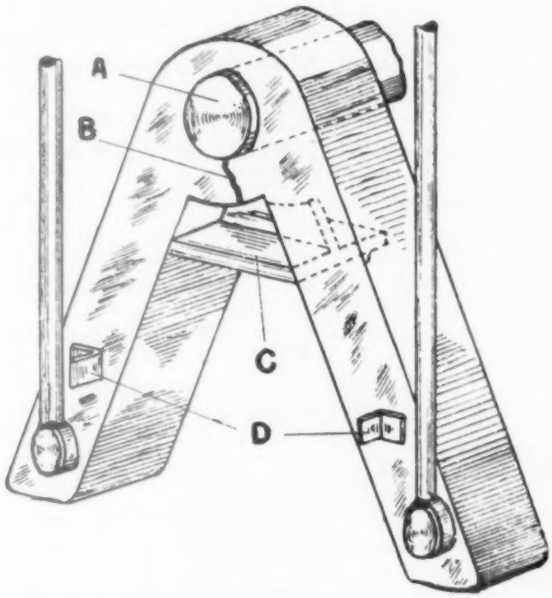
By this arrangement the rollers become available for round material, but, being in a separate frame, are quickly removed when desirable to use the horses for material which doesn't need turning. The ground wire is attached to one leg of one horse. Material is lifted into the horses with overhead crane.

Note the handy moveable seat, with round metal base, used in connection with this job.

WELDER SAVES SMALL FORTUNE IN PERISHABLE GOODS

In a competition put on by The Mechanical and Welding Engineer of Australia, Mr. D. Sandford won first prize for his article describing an interesting repair job which he had done. According to the article, which was published in the July issue of the above mentioned magazine, Mr. Sandford was called in to investigate a breakdown of a large ammonia compressor in an ice plant. It seems that a crack had developed in the boss of the rocker arm as is shown in the sketch. The officials of the plant were quite worried, as the replacing of the arm would take about three days, during which time the refrigerating rooms would become warm and several thousand dollars' worth of perishable goods would be destroyed. The rocker arm had been shrunk and keyed to the shaft and in event of replacement, this meant that the shaft would have to be taken out of the machine so that the arm could be dismantled in the hydraulic press.

Mr. Sandford, though, saw a way of making the repair without dismantling anything. The rocker arm was of cast steel. The crack was veed out by an acetylene torch. Angle cleats (D) were welded to each arm of the rocker for the



Sketch of the Rocker Arm Showing Strengthening Piece Inserted.

purpose of pulling them back into their normal position. With that done, the vee was electrically welded. But as the arm had originally had a low factor of safety, it was evident that it needed reinforcing. With this in view, a piece of structural iron 12 in. x 18 in. was fitted, as shown at (C), to fit snugly under the boss and between the two arms. Then it was electrically welded in, and the arm had been strengthened to quite an extent. The work was all done in position by the welder and assistant in four hours.

RESTORING STOKER WORMS
By J. C. Coyle

The tonnage hauled by a modern locomotive over steep mountain grades seems marvelous to those who recall the heart breaking toil required of railroad firemen a few years

Stocker Worm Rebuilt by Arc Welding.

ago in getting the light trains of those days over the grades. Mechanical stokers now feed the roaring furnace, while the fireman spends his time with lighter, yet necessary tasks.

But even the iron fireman feels the effect of the steady

grind required, and the worms of a stoker wear thin. Arc welding is then brought into play to build up the worn worm and restore it to service. The photo shows a stoker worm in the welding booth at the Denver shops of the Denver & Rio Grande Western. A steel bench, built up by welding, with a pair of rollers set in a metal block and welded to its top, is placed under each end of the worm so that it is easily turned as the work progresses. The welder fabricates his own stool and rod holders from light material by welding it together.

WELDING MAKES STRONG STAIRS AT LESS COST

Around many public buildings and industrial plants it has been found that wooden stairways are not strong enough to stand the service they get and require such frequent repair and replacement that metal stairways are getting to be a popular substitute. The sketch shows two methods of designing a metal staircase using ordinary channel iron and diamond plate. One of the sketches shows angle clips welded in underneath the plate, which forms the step. This is the sort of design which would be followed by one who was accustomed to assembling everything with rivets; the angles, however, are entirely unnecessary. A simpler, cheaper and perfectly satisfactory method of construction is shown in the other sketch, in which no angles are used. Sometimes, in order to make the fitting more secure, a small flat strip is welded on the front edge of the step. This does not need to be a continuous weld as a few tack welds will hold it securely. Another method of construction is to use channel in place of the diamond plate, welding it in with the flanges upward and filling in each step with concrete.

Designs for Constructing All Welded Steel Stairs.

COMIC STRIPS PULL SALES

Fred E. Kunkel

The Weldit Company, in Washington, D. C., has effectively employed humorous advertising as a means of catching the eye of newspaper readers and fostering attention on their welding service.

These eye-warmers have helped to pay dividends in the selling game, for this comic strip advertising has caused a decided upward spurt in the inquiry and sales curve. "Be It A Bull or a Bear, When It Comes To Welding, We Are There" is the slogan behind these comic strips which are a daily feature in the newspapers, usually opposite reading matter and occupying a space of two columns by 35 to 40 lines.

Sometime ago some boys in their devilish pranks cut off the tail of a bronze Buffalo on one of Washington's finest bridges. The newspaper reporters made the most of this incident about the tailless Buffalo, and everybody in Washington talked about it. The Weldit Company seized their opportunity and took the bull by the tail to capitalize on this incident by featuring their workmen welding the tail on the Buffalo.

Coupling a catchy caricature with a small compact text, which may be easily read at a little more than a glance, has been the basic principle underlying the Weldit Company's sales tactics, which have not only brought favorable and witty comments from customers, but they have also centered attention on Weldit Company service. In fact, these comic strips have produced better results than any other means of advertising that were ever before attempted.

By using these "funny" pictures, Weldit Company advertising stands out on the printed page like a moving electric sign in front of the theater to catch the eye, no matter how clustered the rest of the newspaper page may be with various other advertisements and reading matter. A few lines of conversation mixed with advertising fuel for effective results include such sayings as:

"Some people are not aware of the newest industry of the age. It is the art of welding or melting together all metals by means of an intensely hot flame. The Weldit Co. will weld your frozen auto engines, bumpers, furnace and stove parts and broken machinery at a great saving in time and money."

The striking feature of this advertising is the fact that the name of the company, its street address, and telephone number, are prominently featured in heavy black type. Other ads appeal to the welding of broken machinery, such as:

"Every person handling machinery will break some part some time. Don't worry; take it to the Weldit Co. and they will weld it as good as new, without delay at a great saving in money and time. No job too large or too small."

An appeal is also made to the winter troubles of automobiles, such as:

"If you own a Ford car and the engine head froze and cracked, don't worry—have it welded for $1.50 at the Weldit Co. We will also weld the engine in the car for $3.50 to $7.00. Other broken metals welded without delay. We save you money."

The great majority of newspaper readers are interested in humorous effects and funny pictures, and consequently Weldit Company advertising reaches both men and women. The ordinary type of reader who seldom glances at an ad is taken unawares by this type of advertising, and by force of habit reads them. Since the ads can be quickly taken in at a glance, even the most casual reader can not fail to catch the significance in just a few seconds. Even the most solemn and serious face breaks into a smile and shows an interest in this type of advertising of "Bull or Bear."

As a consequence, Weldit Company advertising is not only seen, but also read. By means of cartoons the sales message is driven home in a most direct and pleasing manner. Humor affects everyone, and these funny pictures naturally attract attention. The picture of Weldit Company workmen welding the tail on the Buffalo on the Q Street Bridge, with the heading of Bull or Bear, is such as to arouse curiosity and compel a reading of the text, and so the ad is able to drive home a single idea with sledge hammer effect.

The wordage used seldom runs over 20 to 40 words, and the text is really the skeleton outline for introducing the Weldit slogan of "Bull or Bear." Brevity and the singleness of theme is an integral part of this advertising scheme which wins results.

HUGE AIR PURIFIER INSTALLED ON PLANT

The accompanying pictures show a tank 48 feet long, 6 feet wide and 8 feet in width. This particular air purifier was recently built on the roof of a Cleveland factory. If your eyes

are sharp you can detect the name on the water tower in the background. The welding of this structure is not unusual or spectacular, but from an economic point of view is well worth studying.

The materials required in the construction of this tank were carried to the roof and assembled, thereby eliminating a great deal of expensive rigging work and handling and time. In the

Views of All Welded Air Purifier on Roof of Cleveland Factory.

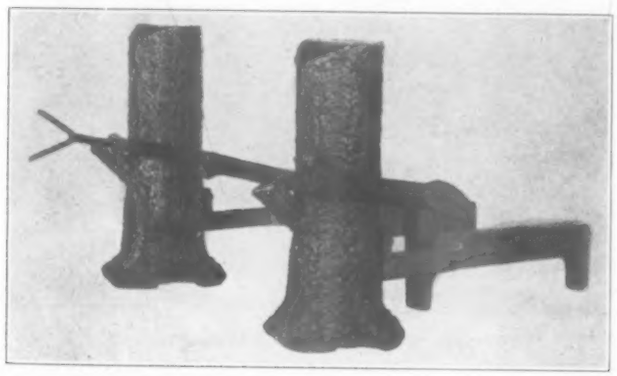
interior of this particular tank, of course, are a great number of baffle plates and angle iron stiffeners which were welded into place.

RUSTIC ANDIRONS MADE BY WELDING

Geoge B. Cox and W. H. Horning, Department of Industrial Arts, Oregon State College

The accompanying photograph of a pair of rustic andirons, made by the Department of Industrial Arts at Oregon State College for the Forestry Department, will probably be of interest to those schools that include electric or acetylene welding in their curriculum. They may also be of passing interest to individuals interested in work of this nature.

These andirons were made for use in a rustic cabin built by students of the Forestry Department on a tract of land used



Welded Steel Andirons Represent Fir Stumps.

by the Oregon State College, School of Forestry, as an arboretum for experimental purposes. As the picture adequately displays, they are intended to illustrate fir stumps, the cross rail of which, while serving as a poker, also represents a forked stick laid across these stumps.

The method of construction is rather simple. Two sections of 4½-inch wrought iron pipe form the foundation for the trunks of the stumps. These sections were approximately one foot long. In order to form the swell at the bottom of each stump, a second section of 5-inch wrought iron pipe was telescoped over the lower end of the smaller pipe and welded solidly to it. This lower section of 5-inch pipe was approximately 5 inches long and had its lower end split in several places with hack saw cuts and flared out to form the buttress representing roots adjoining the tree trunk.

The junctions of the pipes were ground to remove the abruptness of the joint and the whole surface of the pipe section was covered with a succession of beads formed by the electric arc-welding process. These beads, with their characteristic overlapping fissures, give a fairly authentic representation of the bark of a young fir tree. It will be noted that one error was made in that the beads were run in opposite directions on the two stumps.

The knots supporting the forked stick were made of sections of smaller pipe welded to the main trunk. The forked stick itself is also made of smaller pipe sections welded together and left reasonably smooth, in conformity with the smaller branches of the tree. A rusted pipe will give a closer representation than a new, smooth surface.

The upper ends of the stump, as well as the twig ends, were closed with steel discs welded over the pipe ends. To give a more characteristic, natural effect, the discs for the upper end of the stump had grooves turned in them on an engine lathe before being bent to shape and welded in place. These grooves give a surprisingly natural effect, representing the annual rings in the stump.

The shanks of the andirons were cast in the foundry and bolted solidly to the rear of the andiron fronts. The whole project is not only unique, but serviceable and attractive. The only criticism that might be offered is that, because of their close resemblance to real stumps, one sometimes has the impression that they might burn away. The andirons were designed by Mr. W. H. Horning, instructur in forging and welding, and executed by two of the students in that department.

HOW SILVER SOLDER SAVED THE DAY FOR AN ELECTRIC WATER HEATER FIRM

In Wisconsin an ingenious man invented a new type of electric water heater and organized a corporation for its manufacture.

The laboratory sample heater worked perfectly and a factory was leased, machines were installed and materials purchased for the production of a large number of the heaters. The first hundred or so were sold and installed. Then leakage troubles broke out all along the line and the heaters came back.

The device contained a cement core heating unit enclosed in a brass cylinder. The rapid and unequal expansion due to the fact that one side of this cylinder was still cold after the other side was heated by the energized central core, caused the cylinder to part at its head, and also certain connections to give way. They called in expert welders. They tried threading the heads. Nothing succeeded until they hit upon brazing the joints with silver solder. This material solved the problem, because the ductility of the silver in the solder took care of the expansion stresses, which had been so great as to rupture both threaded and autogenous-welded joints.

Thus, a few cents worth of silver solder on each $150.00 machine solved a problem which might otherwise have wrecked an ambitious manufacturer of a worthy device.

ALL STEEL SHOP EQUIPMENT

A new bulletin of the Standard Pressed Steel Company, Jenkintown, Pa., lists a number of interesting items of shop equipment of all steel construction. There are three different styles of desks for foremen, a locker room bench in two styles, and two styles of semi-portable work benches. One of these semi-portable work benches is equipped with short handles so that one end can be raised. The other end is equipped with two wheels so that it can be pushed around the shop like a wheelbarrow. When put in position it becomes a perfectly steady work bench and the handles spring down and out of the way. This bench is about five feet long and two feet wide in standard size and the manufacturers state that other sizes can be furnished.

TUNGSTEN CARBIDE SCRIBER

A useful device for welding departments is a new scriber recently put on the market by McIntyre & Kerr, 1741 Eight Street, Berkeley, Calif. The tip of this scriber is made of tungsten carbide, this tip being mounted on a steel shaft the length of an average pencil. When not in use the point is protected by a cap similar to a fountain pen cap. This scriber is said to have an advantage over the diamond pencil in that it has one point only, making it possible to write or mark wherever it is desired on glass or hardened steel. The retail price of the device is $1.00.

NEW OXYGEN PLANT AT PITTSBURGH

Announcement has been received that Mr. John Butler, formerly manager of the Burdett Oxygen plant at Pittsburgh, Pa., recently resigned from his former connection and has organized the Butler Oxygen Company. Plans are being made for the construction of a new oxygen producing plant which is expected to be ready for operation within a few months. In addition to this oxygen business the Butler Oxygen Company is planning to sell a complete line of oxy-acetylene welding and cutting apparatus and supplies.

LARGE GAS LINE IS ARC WELDED

Gas will soon flow through the Uinta Pipe Line Company's new arc welded line from the junction of gathering lines, which is southeast of Rock Springs, Wyoming to Ogden and Salt Lake City, Utah. The total length of the line, when completed, will be 277 miles. Of the total mileage, 200 miles

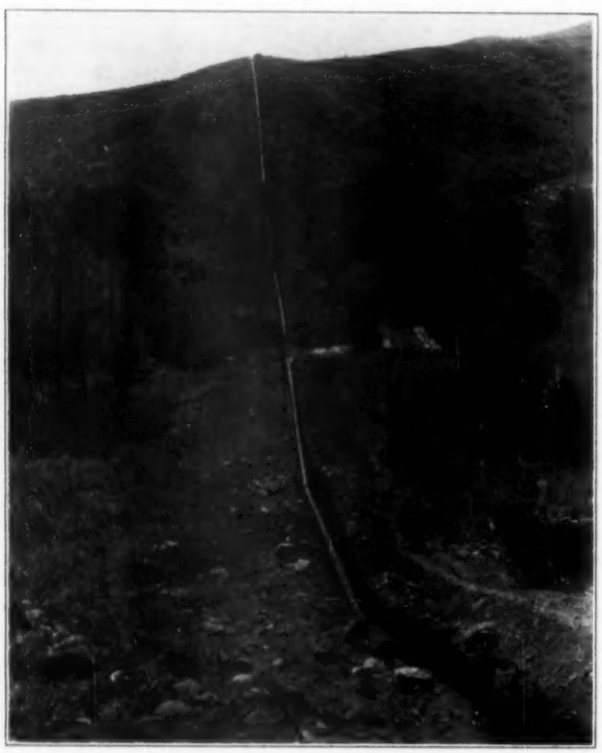


Fig. 1. The Welded Pipe Line on a 60 Per Cent Grade.

is of 18 inch pipe, the balance being of 16 inch pipe consisting of a 42 mile branch to Ogden and a 35 mile branch to Salt Lake City.

The pipe used in this gas carrier is of arc welded manufacture produced in 30 foot lengths having bell, and spigot with welding dam ends. Each length weighs 1,600 pounds. Due to the ruggedness of the country and the steep grades encountered, some of the pipe had to be snaked into position by tractor, after having been delivered as near location as possible by truck. Some idea of the nature of the country traversed by this line may be obtained by observation of Fig. 1, which shows a completed portion of the line on a 60 per cent grade.

The customary practice of lining up a number of lengths of pipe to form a section is followed in the construction of this line. The number of pipe lengths in each section varies, depending upon the contour of the ground. In lining up a section, the spigot ends of the pipe lengths are inserted into

Fig. 2. Welder in Action with the Pipe on Rollers.

the bell ends and the entire section, thus formed, is leveled by shoring or blocking up with timbers. One innovation which facilitates turning of sections, during welding operations, was introduced on this line. A set of four steel rollers consisting of two pair mounted on a steel channel base is placed on the top shoring timber on which the pipe rests.

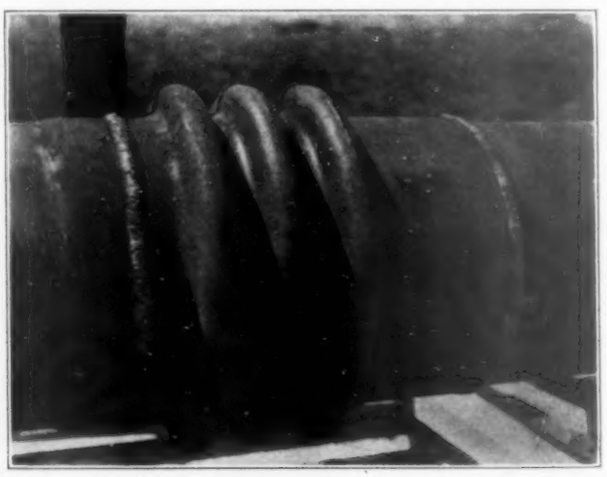


Fig. 3. Expansion Joint Welded in.

A view of a set of rollers is shown in the foreground of Fig. 2.

After the pipe is lined up and leveled in sections, each joint is tack welded. This is necessary to keep the section intact, due to extreme changes in temperature which through contraction and expansion of the pipe causes it to open the joints or buckle, as the case may be. By tack welding, the pipe lengths are joined so that contraction and expansion acts on the section as one unit instead as separate pipe lengths.

Each joint in the section is arc welded twice, two separate beads being run around each joint. This is done to prevent all possibility of pin hole leaks. The first, or burning-in bead, is arc welded with $\frac{5}{32}$ inch electrodes. Approximately $\frac{3}{4}$ pounds of electrode metal is used to weld the burning-in bead in the 18 inch joints on this line. The second, or finish, bead is arc welded with $\frac{1}{4}$ inch electrodes, approximately $1\frac{1}{4}$ pounds being consumed in making the finish weld. On the firing line which is the scene of welding the pipe lengths into sections, welding speeds ranging from 8 to 12 joints per man per day are being obtained.

After the pipe is welded into a section, the section is then placed over the open trench on skids and welded into the line. This welding is known as bell hole welding. Being unable to turn the line, the operator must weld around the pipe, necessitating overhead welding. Only in this respect does bell hole welding differ from firing line welding. The speed of welding bell hole joints of this line varies from six to eight joints per operator per day.

To take care of the expansion and contraction of the finished line, caused by temperature changes, a special type of an expansion joint of all steel construction is welded into the line at intervals. Figure 3 shows a typical expansion joint, also examples of completed arc welded joints.

The major portion of this line is being arc welded by the owners, the Uinta Pipe Line Company, who are using 10 "Stable-Arc" Welders, manufactured by The Lincoln Electric Company of Cleveland, Ohio. They are of the gas engine driven type of 300 ampere capacity with a current range of 75 to 400 ampere, and operating at a speed of 1500 RPM. The engine is of the six cylinder type and is directly connected to the generator by a flexible coupling and both mounted on a structural steel channel base. The welders are mounted on wagons and are moved along the line by teams.

NAME PLATES ON A. C. WELDERS

By M. P. Bailey, Detroit Edison Co.

Wih the upward trend in the use of electric welders an economic problem is bared in the use of, or lack of use, of name plates.

When a small shop buys an elecric A. C. welder the electrician is called in and also a representative of the power company serving his territory. The question of economies starts at once. The electrician looks at the name plate and usually finds the primary voltage and secondary amperage. He then installs the wiring heavy enough for the name plate record, which is certainly safe enough. The representative of the power company, unless familiar with the name plates, will recommend a transformer of sufficient capacity to care for the Kva. indicated by the primary voltage and secondary amperage. The minimum bill for the electric service is usually based on the Kva. capacity of the transformer installation. This causes a higher charge against the customer.

The extra heavy wiring installed increases his investment charge. It is then that the customer wonders at the cost of electric welding.

The writer has found many instances where the above mentioned costs could have been reduced if the name plate had been properly marked. Only recently one welder was found without a name plate and it was necessary to trace the sale and find out the size of transformer used in the box.

The name plate should clearly state the primary voltage and frequency, also the primary amperage corresponding to the Kva. rating. Where there are taps for varying the secondary amperage the current rating should be marked secondary amperage very plainly. The Kw. welding capacity and Kva. transformer rating would complete an electrical record which should help everyone engaged in placing welding apparatus in operation.

MILBURN OFFERS PRIZE FOR DEVELOPMENT WORK IN GAS CUTTING

The Alexander Milburn Company of Baltimore, Maryland, one of the pioneer manufacturers of welding and cutting equipment, is offering a series of prizes to further interest in experiments tending toward lowering the cost of cutting with the torch. These prizes are divided into three offers of $1000.00 for 1930, 1931 and 1932 for the best authenticated results accomplished with illuminating or by-product gases tending to lower the present cost of cutting. A committee of competent engineers and the head of one of the leading engineering schools have been asked to act as advisors and to appoint the judges. The Alexander Milburn Company states that it is offering these prizes with the thought of arousing public interest in furthering economical developments in this field. Particulars concerning the methods of determining the awards will be furnished upon application to the Alexander Milburn Co.

MERGER OF THOMSON AND GIBB COMPANIES

A consolidation of the Thomson Electric Welding Company of Lynn, Mass., and the Gibb Welding Machines Company of Bay City, Mich., has been announced, the new company to be known as the Thomson-Gibb Electric Welding Company. Both plants will continue in operation. The Thomson Company is a pioneer resistance welding company, having been formed in 1886 to exploit the resistance welding patents of Professor Elihu Thomson of Lynn, Mass. Professor Thomson has always been an officer and director of the Thomson Company and will continue with the new company in both capacities. The Gibb Company has been one of the most active of the Western companies and has specialized in seam welding.

The Thomson-Gibb Electric Welding Company offer a full line of butt, flash, seam, spot, projection, and wire fabric welders, together with expert service designed to secure uninterrupted production and uniform quality from its machines in the hands of manufacturers.

For some time past it has been the desire of the Thomson and Gibb companies to improve the existing system of distribution of welding machines. It is pointed out that the user of welding machines is not so much interested in the welding machine as in the product of that machine, both from the standpoint of uniformity of product, and from the standpoint of uninterrupted production.

The welding machine is but one of many special machines in a manufacturing plant. It is unusual to have in an organization an individual who would be as well acquainted with the welding machine itself and its ultimate capability as the manufacturer of the machine. Therefore, the missing link is the service engineer to make frequent inspection calls and to act in an advisory capacity. It is this link which the new company proposes to adequately supply.

With the consolidation of the Thomson and Gibb companies a new and complete engineering service is made possible through the maintenance of local service engineers to insure the maximum production from every Thomson-Gibb machine. The Thomson-Gibb Electric Welding Company expect to immediately place competent engineers direct from the factory, at Boston, New York, Philadelphia, Cleveland, Cincinnati, Detroit, Chicago, and St. Louis. Such additions to this staff will be made in the future as may be required to keep all machines operating at their maximum efficiency.

PRIMOGAS FOR CUTTING STEEL

Primogas is a compressed gas for use as a fuel gas for cutting torches. It is manufactured by the International Oxygen Company, Newark, N. J., who have recently issued a four-page bulletin describing its characteristics. Attention is called in the bulletin to the fact that this is not a liquid or a dissolved gas and that it will not freeze in the regulators at any temperature down to 10 degrees below zero. Numerous tests have been made with it on metals of different dimensions and the bulletin reproduces the results of one test to show the total cutting cost per foot on steel from $\frac{1}{16}$ inch to 1 inch thickness.

AIRPLANE FUSELAGE WELDING

Of interest to all persons engaged in the manufacture of aircraft is the booklet recently introduced by The Linde Air Products Company on the subject of Airplane Fuselage Welding. This booklet, a 12-page illustrated pamphlet, outlines the

correct practices for instruction of welding operators who are to be engaged in airplane manufacture. The second part of the booklet carries a discussion on the welding of Duralumin. These booklets are available from The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., or from any of the district sales offices located in 26 of the large cities of the country.

AMERWELD SPOT WELDER

The American Transformer Company, 178 Emmett Street, Newark. N. J., recently announced the Amerweld electric spot welding machine. A battery of 50 of these small welders can be accommodated on a bench 100 feet long and 6 inches deep. The machine can be supplied for operations on circuits of any frequency and voltages up to 550. The standard units are for 220 and 100 volt, 60 cycle circuits. These machines are made for welding small metal parts, such as, elements in radio and light bulbs, jewelry, dental supplies and novelties made of light metals.

WELDED BRIDGE IN POLAND

In the first issue of "The Welder," a new bi-monthly magazine published by Alloy Welding Processes, Ltd., London, England, there is a description and a number of illustrations of a welded road bridge under construction in Poland near Lodz. The bridge carries the road from Warsaw to Posen. over the Sludwia. It was designed by Professor W. Bryla of Warsaw University and built by the firm of Rudzk of Warsaw. The welding work itself was done by La Soudure Electric Autogene of Brussels, who are licensees of Alloy Welding Processes Ltd. The bridge weighs 55 tons, as compared to a calculated weight of 70 tons, which would have been required for a riveted bridge. The structure has two parabolic girders of 27 meters span; a maximum height of 4½ meters. Temporary field connections were made with bolts and gussets were entirely eliminated in the design. A few butt straps were used, however. The girders are made up mostly of wide flats welded in the field without angles. The flanges of compression members were stiffened with welded angles. The longitudinal girders were welded direct to the cross girders without corner flats. The joints between the longitudinal girders and cross girders were reinforced with flat bars which serve as stiffeners for the cross girders. Most of the welding was done without any preparation of the parts, the details being welded in the shops. The estimated amount of welding was 1,100 hours in the shops and 900 hours in the field.

CLEVELAND FIRM GETS INTERESTING CONTRACT

H. E. Wetzel, Jr., engineer of the firm of Smith & Oby, announced today that they had secured a contract from the Chase Ohio Brass Company of Cleveland which will involve many interesting welding problems.

The contract in question will mean hiring a great many additional welders to their present staff of experts. Mr. Wetzel is going to set up a testing laboratory in his shops to qualify applicants for jobs. A great deal of this new contract work, of course, will be done by oxy-acetylene welding. In order to give applicants a fair and impartial trial he is going to install as many different makes of oxy-acetylene apparatus as possible. When an applicant applies to him for a tryout he will allow the man to pick out the particular apparatus with which the applicant is most familiar. Moral: "No alibis." If the applicant makes a weld with a given preference as to apparatus, that make of apparatus will be given the man on the actual job. This is something entirely new, but the idea seems to contain a lot of common sense. People drive different makes of automobiles largely because they prefer one make over the other. Men smoke different cigars and cigarettes largely because they prefer one make to another. Carpenters buy saws, chisels and other woodworking tools of different makes largely because they prefer one make to the other. It is not unusual to assume that welders prefer one make of apparatus to another, and, therefore, do better work with apparatus of their own choice.

COLEMAN ELECTRICAL SCHOOL OFFERS COMPLETE WELDING INSTRUCTION

The Coleman Electrical School, located at 1624 Main St., Kansas City, Mo., has a complete gas and electric welding department, which is described in detail in an eight page bulletin recently prepared. In the oxy-acetylene welding department, acetylene is supplied from a large generator carried to the welding stations through an overhead pipe line. The welding tables, made of welded angle iron with fire brick tops, are arranged in neat orderly rows through the center of the shop. Welding and cutting torches of leading makes are furnished in sufficient number to take care of a much larger number of students than the school has ever been called upon to handle. Electric arc welding machines are arranged in booths along three sides of the big shop. Large screens give complete protection to the other students from radiation and ample space is provided so that students work under best possible conditions. Both direct and alternating current machines are used and all students get practice in welding with both types of current. In addition to teaching the fundamentals of welding, the Coleman school gives particular attention to such specialties as aircraft, pipe line, structural steel and tank welding. Brazing and aluminum welding are included in gas welding courses and the electric welding instruction includes instruction in welding with the carbon arc. Students are advised to take the day course whenever this is possible but for those who cannot attend days night classes are held. The only difference between day and night instruction is in the length of time required to complete the course. In the day course one month is the time required to complete the combination of oxy-acetylene and electric welding. The system of instruction is practically all shop work with lectures and class-room work eliminated. The instructor is Mr. Charles F. Meagher, who has had a wide experiencec in welding in navy yards, aircraft factories, pipe lines and contract welding shops.

Fig. 1. The 10 Arc Welding Machines Now In Use.

Fig. 2. A Section of the Oxy-Acetylene Welding Department.

HASCROME WELDING ROD

The Haynes Stellite Company of Kokomo, Indiana, has placed on the market a manganese-chrome-iron welding rod called Hascrome. This is a self-hardening alloy, designed primarily for building up badly worn parts preparatory to surfacing them with Haynes Stellite, which is also supplied in the form of welding rod. Since the cost of Hascrome is materially less than that of Haynes Stellite, the resulting composite surface is much cheaper than if entirely built up with the latter alloy. Hascrome may be used for building up large sections of steel or cast iron, and forms an excellent base for Stelliting because it is sufficiently hard to resist deformation under impact, and because of the ease with which Haynes Stellite flows onto it. Although in some cases Hascrome alone may be used for hard-surfacing parts subject to abrasive wear, it does not possess red hardness to the same degree as Haynes Stellite, and it will wear away more rapidly. The new allow is also being used for tacking Haystellite—the Haynes Stellite Company's diamond substitute—to the cutting and reaming edges of oil well drilling tools.

The oxy-acteylene process is considered best for the application of Hascrome, since the hardness of the deposited metal can be controlled by the amount of excess acetylene used in the welding flame, as well as by the rate of cooling. The greater the excess of acetylene in the flame and the slower the cooling rate, the harder the deposit will be. When quenched, the metal becomes softer and tougher.

Left: Base of the Crusher, Showing the Thickness Hascrome Application. Right: Ready for Haynes Stellite Facing.

Hascrome is applied to steel without puddling the steel. Best results are obtained when the desposit is made just as the steel surface is at a "sweating" heat. The following figures give results obtained under average conditions:

	Brinnell Hardness
Small excess of acetylene	
Slowly Cooled	250-300
Quenched	240-290
Heavy excess of acetylene:	
Slowly Cooled	450-500
Quenched	350-450

The Hascrome deposit has a tensile strength of 40,000 and a compressive strength of 177,000 lbs. per square inch. It can be forged and ground, but not machined.

Hascrome welding rod can also be applied by means of the metallic arc process, by the use of reverse polarity, making the rod the positive electrode. Care must be taken to prevent cracking after quenching when this method is employed. Arc-welded deposits have a hardness of 240 to 400 Brinell, depending on the rate of cooling. Better deposits are obtained when a coated rod is used. An excellent coating can be made as follows:

Calcium carbonate	1 oz.
Silica flour	1 oz.
Sodium bicarbonate	1 oz.
Shellac	1 oz.
Alcohol	16 oz.

Hascrome is available in welding rods ¼-inch in diameter and 36 inches long, packed in bundles of 50 lbs. each.

Left: Badly Worn Rock Crusher in Operating Position. Center: The Two Manganese Steel Castings Which Compose the Cone. Right: Being Built Up with Hascrome.

TWO LEAFLETS DESCRIBE NEW G-E WELDING EQUIPMENT

Leaflet GEA-556C pictures and describes the new automatic welding head and control recently perfected by the General Electric Company. This arc-welding head will automatically first touch the electrode to the work and then quickly withdraw it to start the arc. The head will then continue to maintain a constant length of arc by feeding the electrode wire to the weld at the proper speed to replace the electrode which is melted away and deposited in the weld. This machine is known as the Type MC automatic welding head. The leaflet not only describes the control equipment which goes with this head, but pictures the complete outfit set up and in use on various types of work adaptable to automatic arc-welding.

Another leaflet, GEA-569C, pictures and discusses in detail a number of constant-potential arc-welding sets made for any number of operators up to their given capacities. It is stated that these sets are particularly adapted to automatic welding. They are designed to generate direct current at 60 volts at all ampere outputs up to their rated capacity. The standard sizes for these welding generators are 400, 500, 750, 1000, and 1500 amperes at 60 volts for one hour.

TORIT KEROSENE BURNER NO. 8-K

When welding heavy pieces of iron and steel with the oxy-acetylene torch it is usually necessary to first preheat the section. The preheating operation eliminates any strain with resulting warping or cracking that would otherwise occur if an attempted "Cold" weld were made. It also gives a weld that is "Soft" and easily machined. It also saves oxygen and acetylene. Good oxy-acetylene welding must therefore depend to a considerable extent on good preheating equipment.

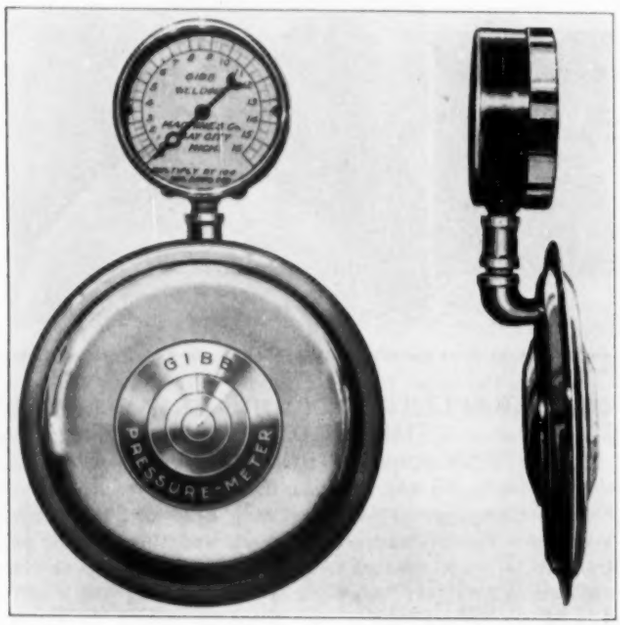
The St. Paul Welding & Manufacturing Company, 174 West Third Street, St. Paul, Minn., has for several years used a portable, hand pump outfit, which they have put on the market

as the TORIT 8-K. The torch throws a flame about two feet long. The tank of 10 gallons capacity is equipped with a double-acting pump, allowing for suction of either air or kerosene. Thus the tank can be refilled while the torch continues to operate. The outfit being portable allows for use inside or outside the shop and in any kind of weather.

A WELDING MACHINE PRESSURE METER

The Gibb Welding Machines Company, of Bay City, Michigan, manufacturers of electric resistance welding machines, have just placed on the market a welding machine pressure meter that indicates, in pounds, the pressure obtained at the welding electrodes.

This pressure meter, which is illustrated here, operates by hydraulic pressure. The oil reservoir is simply formed by seam welding the edges of two stamped discs. The seam weld is absolutely leakproof and pressure tight.



The New Gibb Pressure Meter for Electric Welding Machines.

To determine a certain welding pressure the oil-filled disc portion of the Gibb Pressure Meter is placed between the electrodes of the welding machine and the pressure applied is registered, in pounds, by the indicating part of the meter.

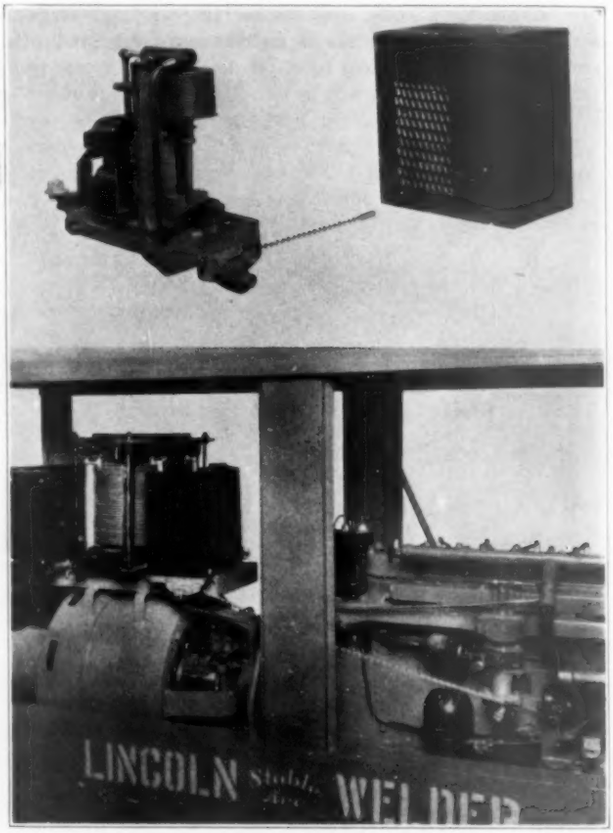
The advantages of the Gibb Pressure Meter are numerous. The most outstanding advantage being the ease with which a welding machine can be set to the exact pressure desired. All guess work is eliminated. When the pressure meter is used, operators are absolutely sure that their welding machines are operating at the correct pressure.

The Gibb Pressure Meter facilitates the recording of correct pressure for certain welding jobs. A welding machine may be set up and adjusted for a certain production run. The pressure meter makes possible the accurate recording of the proper pressure for that job. After completion of the above mentioned run the machine may be set for an entirely different run and the pressure indicated by the meter is recorded for this new run. With the Gibb Pressure Meter the operator can quickly and easily reset his machine for more of the original run.

The Gibb Pressure Meter is small and compact. It has a highly polished chrom-plated surface. The complete unit weighs only approximately two pounds. The manufacturers and others thoroughly experienced with electric welding claim that this pressure meter fills a long-felt need in the industry.

NEW LINCOLN IDLING DEVICE

An automatic idling device or throttle control for regulating speed of engine in Lincoln "Stable Arc" welders of the gasoline engine driven type has recently been perfected by The Lincoln Electric Company, Cleveland, Ohio. The new device automatically increases the speed of the engine from normal idling speed to the proper speed for welding service whenever the arc is struck. When welding is discontinued, the device



Views of the New Lincoln Idling Device.

automatically reduces speed of engine to normal idling speed.

The operating mechanism of the device consists principally of a small metal bellows and an electric magnet. When the arc is struck the armature of the electric magnet opens a relief valve in the bellows, causing them to inflate, which in turn allows a coil spring to open the engine throttle. When welding operation ceases the bellows are deflated by suction of engine intake, thus causing the closing of the engine throttle to idling position. The idling device is provided with a control lever which may be set for automatic throttle control, for continuous idling speed or for governed speed.

The device is so designed that a momentary interruption in welding will not cause a reduction in speed of the engine. It is estimated that the use of the automatic idling device will effect a saving in fuel consumption of approximately 25 per cent.

THE NEW WESTINGHOUSE DUAL DRIVE WELDING UNIT

A New Dual Drive Arc Welding Unit has been introduced by the Westinghouse Electric & Manufacturing Company. This set rounds out a complete line of welding equipment.

The unit consists of a standard 300 ampere, single operator welding generator, a 15 hp., alternating current induction motor and a six cylinder, 1800 rpm., Model P-45 Continental gas engine, all mounted in tandem on structural steel welded base. The motor operates on 220 volts, but by merely reconnecting the external motor leads and changing the line-starter coil, it can be used on 440 volts, thereby giving additional flexibility

to the complete unit. The welding generator can be driven by either the gasoline engine or the electric motor by simply engaging or disengaging a slip coupling or clutch, whichever is provided.

The dual drive welding machines can be furnished in all

The Westinghouse Dual Drive Welding Unit.

the popular single operator ratings, stationary or portable.

There are many advantages claimed for dual drive welders for field service, especially in the case of structural steel contractors and welding jobbers, who are continually moving from one location to another. The motor can be furnished to operate on practically all industrial power circuits, wherever electric power is available. In isolated places, the engine is used for driving power, providing a flexible welding unit independent of local power limitations.

"BOROD"—A NEW STOODY PRODUCT

After many months of exhaustive tests, Stoody Company announce "BOROD"—a welding rod which deposits a smooth, continuous layer of tungsten carbide alloy over any desired area.

Since the inception of what is termed as "hard facing" there has been a constant and most persistent search for some means or process whereby a desired surface area could be completely overlayed with Tungsten Carbide alloy. Many methods have been recommended, each, upon adoption, were found partially successful, but none of them could be considered as entirely satisfactory for use under any and all conditions. The new Stoody material is offered as solution to the problem.

"BOROD" is marketed in welding rod form and is ready for use with no preparation. When applied with the electric arc, it should be used as the positive electrode and melted down as a soft steel welding rod would be. If applied with the oxy-acetylene torch, the application is equally simple. By either process, the deposit will be found to have a smooth, continuous surface and be well amalgamated with the parent metal as well as have the characteristic hardness and resistance to abrasive wear found in tungsten carbide alloys.

When deposited with the electric arc, preheating the surface to be covered to a dull red heat, so that both the deposit and the parent metal may cool simultaneously, avoiding structural strains in both metals, the deposit left will have no tendency to surface check, neither will the parent metal be under any structural strain. It penetrates unusually well and has much inherent cohesion. Both characteristics are desirable in a hard facing deposit.

As an example of one of the tests made, a large surface was completely overlayed with "BOROD" by electric arc application, using approximately 150 amperes of current and 25 volts across the arc. The deposit, which was found to be a smooth even coating of Tungsten Carbide, gave the characteristic hardness readings of that alloy and yet, when the deposit was subjected to all manner of abuses such as hammering, grinding and attempted chipping, there was no tendency for the deposit to crumble or even check. Further than that, the penetration of the overlaying deposit was found to be equal to the penetration of soft steel welding rod.

PIPE WELDING WITH STOCK FITTINGS

Two bulletins of great importance to those who are using or contemplating using welded joints in the installation of pipe lines of all kinds have recently been published by Tube-Turns, Incorporated, Louisville, Ky. One of these bulletins, No. 104, is entitled "Pipe Welding With Stock Fittings in the Process Industries." This bulletin points out that the ideal pipe installation would be a continuous line without joints and that the development of satisfactory welding methods for the construction of pipe lines has brought about the nearest possible approach to this ideal. In the process industries, perhaps more than in any other industry, positive, dependable joints are imperative since the failure of joints mean waste, loss, exposure to fire hazard and shut downs for repairs. Welding has proven such a satisfactory method of making joints that in many of the largest industrial organizations welded headers and branch piping have been accepted for a long time as the most economical and safest method of construction. The booklet discusses the various advantages of pipe welding, then calls attention to the fact that where branches, headers or changes of construction are required a stock fitting, ideal in its construction for welding, exists in the shape of Tube-Turns, which are forged under heat and pressure from seamless tubing. Photographs show these stock fittings in use in refineries, paper mills, refrigeration system, pipe lines, etc. Diagrams show a comparison of the strength of welded joints compared with threaded joints and the comparative friction losses with different types of elbow construction. An especially interesting portion of this bulletin is a play lay-out showing a 10-inch high pressure pipe header designed for flanged connections and re-designed for welding with Tube-Turns. The second booklet describes the pipe welding with Tube-Turns in the new power plant at the Bureau of Standards, Washington, D. C. Modern in every respect, the present new power plant is designed to operate at 250 pound pressure and 100° pure heat. The details of its design and construction are given by Mr. J. H. Zink, President of the Heat and Power Corporation, Baltimore, Maryland, which made the installation.

BULLETIN DESCRIBES USE OF TYPE-S WELDING ROD

A bulletin was recently received from the Fusion Welding Corporation, Chicago, describing in detail their new Weldite Type-S Welding rod. This rod was designed primarily for welding the air quenching austenitic chrome-nickel alloy steels.

In the general description of the metal given in the bulletin it is stated that the Weldite Type-S Metal is an alloy steel containing approximately 18 per cent chromium, 8 per cent nickel and very little carbon. The physical properties of this metal may be controlled by cold work which hardens it, or by annealing, which softens it. Numerous other properties are mentioned and the metal is specially recommended by the manufacturers for use on electrical equipment, chemical, heat treating, and annealing containers.

In the section of the bulletin devoted to a discussion of the operating technique they recommend that the metallic arc or the oxy-acetylene flame be used with this metal on 14 gauge or heavier work. For the metals of lighter weight than 14 gauge the Carb-O-Flux method is suggested by them. Further

interesting details of operating procedure are given in this section, such as the action of the metal during welding and what peculiarities in expansion and contraction to watch out for. Recommendations are made for the sizes of tips to use with the Type-S welding rod for gas welding and the sizes of electrodes to use in arc welding. Also the current values are suggested.

The bulletin concludes with a list of the properties of Type-S metal, giving ultimate tensile strength, Brinell hardness, yield point, elongation, etc., both when cold worked and annealed. A list of the corrosion resisting properties are also given.

A PRACTICAL BOOKLET ON ALL TYPES OF WELDED PIPING

"Design Standard for Oxwelded Steel and Wrought Iron Piping" is the title of a new publication recently received from The Linde Air Products Company. It is made up in the form of a booklet, pocket size, and with some 70 pages of very practical material regarding the oxy-acetylene welding of all kinds of piping. In the introduction it is stated that it is intended to enable the engineer and architect to design gas welded steel or wrought iron piping systems, for any purpose, according to the best practice yet developed, and it contains all the necessary structural details.

The first half of the booklet is devoted to giving thorough descriptions with numerous drawings of all variety of designs used in welded piping. This part of the book is divided into a dozen sections, the headings of which give one an approximate idea of the subjects dealt with. A few of these are as follows: Application of Fundamental Welding Designs, Welded Line Joints, Special Reinforced Welded Joints, Pipe Flanges, Welded Tee and Branch connections, Standard Pipe Bends and Tube Turns, Welded Pipe Headers, etc. Special attention should be called to the excellent collection of drawings in this section with all details named and dimensions marked.

The appendix of this booklet contains 17 valuable and interesting tables covering various phases of welding piping research such as, Dimensions of Standard Welded Steel Pipe, Dimensions of Standard-Weight Wrought Iron Pipe, Tensile Test Butt Welded Joints Lap-Welded Steel Pipe, Data and Specifications of Tube Turns, etc. There are also a number of drawings showing fabricated bends, pedestal elbows, and a plan of a typical welded construction.

The final pages contain a specification for welded piping worked out by The Linde Air Products Company and a glossary of the terms used in the book. Undoubtedly this booklet should be of much interest and value to all those whose work deals with any phase of the installation of piping systems.

EXPLAINS THE MEANING OF PORTABILITY

In the November issue of "Fusion News," published by the Fusion Welding Corporation of Chicago, Illinois, Mr. Fred Clark, President of the Clark Welding Engineering Company, Ft. Worth, Texas, gives an interesting account of the construction of a pipe line over mountains and through soft marshes and deserts. In this story particular attention is given to the subject of the portability of the gas engine driven arc welder which was used. The great variety of country traversed by the line gave rise to all kinds of transportation troubles, but these were all overcome and the line finished successfully.

EVIDENCE OF THE GROWTH OF STRUCTURAL WELDING

A bulletin recently issued by the General Electric Company of Schenectady, New York, contains a very interesting article by Mr. Frank P. McKibben, in which is included a list of 140 welded steel structures. These structures include bridges, buildings, cars, cranes, frames, towers, ships, and tanks. An appendix gives a list of cities which have adopted building codes permitting the use of arc welding; a list of cities in which welding has been permitted; and a list of those which are at present revising their codes and have welding under consideration. It is altogether an impressive collection of evidence that welding is proving to be an acceptable construction method for steel bridges, buildings and similar structures.

THE PREST-O-WELD MANUAL

The Oxweld Acetylene Company has published this year the "Prest-O-Weld Manual," a 146 page instruction book with a cloth binding, containing complete instructions for welding and cutting by the oxy-acetylene process. This book gives a general review of the oxy-acteylene welding and cutting processes, followed by descriptions and operating suggestions for the various pieces of equipment required. There is a chapter on the identification of metals which describes the various commercial metals, their uses, their apeparance and their action under the welding flame. Succeeding chapters take up the following varieties of welding: sheet steel, steel plate, steel pipe, cast steel, cast iron, bronze welding, sheet aluminum, and cast aluminum. Welding and cutting tables are included to show the tip sizes and pressure recommended for welding and cutting different thicknesses of metal with Prest-O-Lite equipment. It sells for $1.00 per copy.

NEW BOOK FOR AIRPLANE WELDERS

"Airplane Welding," by J. B. Johnson, has just been published. Its 325 pages of generously illustrated text furnish a great volume of practical welding information for those interested in the design and construction of airplanes. The author is Chief of the Material Branch, Material Division of the Air Corps, Wright Field, Dayton, Ohio. He has had a wide experience in actually doing and supervising the operations described in this volume. He has also been one of the foremost contributors of magazine articles on this subject. His book gives a detailed account of the fundamental principles of each welding process, with particular reference to the usefulness of each process in aircraft work. Entire chapters are devoted to the subjects of design, aluminum welding, inspection, repair of welds. An appendix contains a valuable collection of tables of information on aircraft structures and materials. Welders, inspectors, engineers and draftsmen, all will find the volume helpful and practical. It is of convenient pocket size, well bound, and tells for $3.50 per copy. The Welding Engineer has made arrangements to add Mr. Johnson's timely work to its selected book list, and is prepared to make prompt delivery on all orders.

TECHNICAL DATA BULLETIN DESCRIBES WELDED BATTLEDECK FLOORS

A technical bulletin describing the "battledeck floor" construction has just been issued by the American Institute of Steel Construction. This is a floor made of steel plates welded to I-beams. Appended to the description are allowable load tables figured for both web shear or flexure, whichever is least.

Some few experimental floors of this type have been installed during the past year. Special automatic welders have been designed to handle the work and a demonstration of the proper method of construction will be staged at the Seventh Annual Convention of the Institute at Biloxi, Miss., on November 14. Complete engineering data on the floor is provided for the first time in the bulletin just issued.

WELDING CONFERENCES

Preliminary announcements have been received of welding conference dates at engineering schools as follows:

Purdue University, Lafayette, Indiana, December 11, 12, 13.

Iowa State College, Ames, Iowa; January 14, 15, 16.

Oregon State Agricultural College, Corvallis, Oregon; February 5, 6, 7.

Details of the various programs are not completed at this time, but each school is planning to discuss at its conference those phases of welding which are thought to be the greatest practical value and importance to each district. Although a great many announcements are sent out in advance of these meetings, a special invitation is not necessary. The Welding Engineer has been asked to advise all of its readers that they will be welcome at any of the conferences which they can attend.

OBITUARY

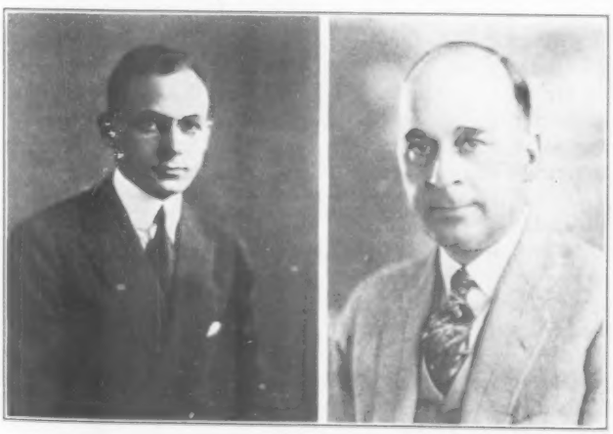
With deep sorrow we record the loss of two prominent members of the oxy-acetylene group in Chicago during the early part of this month. Mr. Charles B. Moore, chairman of the Board of Directors of the Oxweld Railroad Service, Chicago, died on November 9, after a severe illness. His long period of service in the field of railroad welding won for him many friends in that group who will sincerely regret his inability to recover from his recent illness.

Mr. Carl Olson of Oxweld Acetylene Company, Chicago, was killed in an automobile accident November 10. His service as demonstrator of the oxy-acetylene processes and service man date back to the very earliest days of welding and cutting with the torch, and he had a national reputation for his ability with the torch. Highly regarded for his skill and his personality, Mr. Olson will be greatly missed throughout the industry.

NEW RYERSON APPOINTMENTS

Mr. Arthur C. Allshul, formerly manager of the Buffalo plant of Joseph T. Ryerson & Son, Inc., has been appointed manager of their new unit in the Philadelphia district.

As previously announced, the Ryerson Company has purchased the business, equipment, and good will of the Penn-



Arthur C. Allshul and Clarence S. Gedney

Jersey Steel Company at Camden, New Jersey, and are also making other arrangements to provide adequate facilities for a comprehensive stock to meet the requirements of the trade in the Philadelphia metropolitan district.

Mr. Clarence S. Gedney has been appointed manager of the Buffalo plant, succeeding Mr. Arthur C. Allshul. Mr. Gedney has been connected for many years with the specialty sales division of the Ryerson business in the Chicago territory.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,
Of The Welding Engineer, published monthly at Chicago, Illinois, for October 1st, 1929.
State of Illinois, County of Cook, ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared H. S. Card, who, having been duly sworn according to law, deposes and says that he is the business manager of The Welding Engineer, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, G. H. Mackenzie, Chicago, Illinois; Editor, H. S. Card, Chicago, Illinois. Managing Editor, H. S. Card, Chicago, Illinois; Business Manager, H. S. Card, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The Welding Engineer Publishing Co., 608 S. Dearborn, Chicago, Ill. G. H. Mackenzie, 7321 South Shore Drive, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is——. (This information is required from daily publications only.)

H. S. CARD,
Signature of editor.

Sworn to and subscribed before me this 30th day of September, 1929.
G. W. TYLER.

(My commission expires June 25, 1932)

NEWS OF THE INDUSTRY

Papers on electric arc welding were read before the Association of Iron and Steel Electrical Engineers in joint conference with Pennsylvania State College at the William Penn Hotel, Pittsburgh, November 13-14, by K. L. Hansen, Northwestern Mfg. Co., Milwaukee, and J. F. Lincoln, Lincoln Electric Co., Cleveland.

At the October Meeting of the Australian Welding Institute, Mr. F. Bottomley read a paper on "Oxy and Electric Welding of Pipe Lines" illustrated with lantern slides. The paper compared screwed joints with welded joints, showing the economy of welded construction, described the preparation of sections for welding, and told how arc welding is applied to pipe line work.

Miles C. Smith, formerly western manager of The Welding Engineer, was recently appointed promotion manager for the Stoody Company, Whittier, California. Mr. Smith has had many years of experience in all phases of business paper work on the Pacific Coast, and has made a long study of the welding processes and their applications in industry.

Among the out-of-town guests at the November meeting of the American Welding Society, Chicago Section, was F. B. Swankhous of Electric Arc Cutting and Welding Company, Newark, N. J.

At the booths of The Bastian-Blessing Company, Chicago, and Imperial Brass Company, Chicago, in the Coliseum, Chicago, during the annual exposition of the Motor Equipment Association this month, we had an opportunity to greet representatives of these firms from all parts of the United States and abroad, and found them uniformly enthusiastic regarding the welding possibilities in the automotive field.

R. Notvest, factory representative, 447 S. Arlington St., Indianapolis, is now handling the Hansen Arc Welder, and has recently taken on for Indiana the representation of the "Meco" line of oxy-acetylene welding apparatus, manufactured by the Modern Engineering Company, St. Louis, and is carrying a considerable stock. He will also distribute Page-Armco Welding Wire.

Industrial Welded Alloys, Newark, N. J., has acquired a four acre site and buildings containing 75,000 square feet of

floor space from the Tital Steel Company, of Newark. The plant is located on Lister Ave.

C. J. Haines, vice-president and general manager of the Keith Dunham Company, Chicago, visited London early this month, part of an extensive trip he is making through important European industrial centers in the interests of the Dunham Company.

"The Manufacture and Standardization of Eye-Protective Glasses" was the subject of an illustrated lecture read by Dr. W. M. Hampton before a meeting of the Institution of Welding Engineers, London, November 14th.

The Weldit Ohio Company, with headquarters in the Rockefeller Building, Cleveland, Ohio, has been organized, and has been appointed distributors for Weldit welding and cutting equipment in the state of Ohio. The management will be by Mr. J. R. Bronson and Mr. J. E. Ainslie.

The Harris Calorific Company of Cleveland announces two new distributors added to their rapidly increasing family; namely, the Welding Service Company of Scranton, Pennsylvania and the Moline Welding Shop of Moline, Illinois. The Scranton Company have the two Dombroski Brothers, John J. and Albert F. as proprietors. They are very well known in the Welding Fraternity, having for a number of years built up a large clientele in electric, oxy-acetylene, and forge welding. Their plant is located at 201-205 West Elm Street, at the end of the Elm Street Bridge. The Moline Welding Shop is operated by A. R. Gustafson, who is well known in a large district as an outstanding welding engineer. His plant is located at 840 Third Avenue. His telephone is Moline 2858. Both of the above distributors are now carrying a complete stock of Harris equipment and are in a position to give prompt service on repairs.

At the exposition of the Railway Electric Supply Manufacturers' Association, in connection with the annual convention of the A. R. E. E. at the Sherman Hotel, Chicago, last month, arc welding equipment and materials were exhibited by General Electric Co., Hollup Corporation, E. A. Lundy Corp., National Carbon Co., USL Battery Corp. and Westinghouse Electric & Mfg. Co.

Joseph T. Ryerson & Son, Inc., have purchased the business, equipment, and stock of the Penn-Jersey Steel Company of Camden, New Jersey, effective November 16. This firm carries on hand complete stocks of steel shapes, plates, sheets, hot and cold finished bars, reinforcing bars, etc. They serve all industry and construction trades in the Philadelphia district with prompt shipment from warehouse. The Ryerson Company plan to add to the stock and increase the facilities in order to improve and extend the splendid service for which this company is known.

W. B. Atkins of Seminole, Oklahoma, who owns a line of field welding shops, has leased a location and is making plans for opening a boiler and welding shop in the Oklahoma City oil field. He expects to be ready for operations by about December first.

Tom Melott, of the Top Notch Boiler and Welding Works, of Earlsboro, Okla., is soon to reopen his Oklahoma City field shop. Closing of the shop was necessitated by the serious injury of Mr. Melott last spring in a car accident. Mr. Melott is just out of the hospital for the first time since the accident.

The Linde Air Products Company and The Prest-O-Lite Company, Inc., each units of the Union Carbide & Carbon Corporation, announced that effective September 24th these companies have taken over the assets of the Spokane Oxy-Acetylene Company, involving an oxygen plant and an acetylene plant at Spokane, Washington.

The Alexander Milburn Company, Baltimore, Maryland, has opened an office in Los Angeles operating as The Alexander Milburn Sales Company, 1855 Industrial Street, Los Angeles, Calif. This office is under the supervision of Mr. George R. Roberts, well known on the Pacific Coast among the users of welding and cutting equipment while in the employ of the Purox Company.

The Kelvin and St. John's Technical High Schools in Winnipeg which have had Electric Arc Welding outfits for a number of years have installed sufficient Oxy-acetylene outfits to take care of classes up to twenty. The schools are co-operating with the Plumbers' and Steamfitters' Union which has provided two large classes. E. R. Williams is in charge of the shop at Kelvin and Geo. Gallimore at St. John's.

On September 27, the Colorado Section of the A. S. M. E. held its first meeting of the year. Mr. Spencer, assisted by Mr. Gleason, both from the Oxweld Company, Denver, presented a paper on "Liquid Oxygen."

L. R. McKean, formerly in charge of apparatus sales for the Charles Bond Co., Philadelphia, is now manager of sales and engineering for the Harris Sales Co., 1139 S. 58th St., Philadelphia, distributors of Harris welding and cutting equipment.

Tentative plans are being made to hold the mid-winter meeting of the Gas Products Association at Chicago, January 22, 23 and 24, 1930.

W. J. Hickman, who has sold arc welding equipment in the Milwaukee territory for the past five years has recently become associated with the Lincoln Electric Co., Cleveland, Ohio, in its Milwaukee office at 49 E. Wells St. Mr. Hickman, who is well known in Milwaukee, will take care of a large portion of the industry in and around that city, thus allowing Mr. B. W. Brown, district manager, to spend more time in the outlying districts of the state.

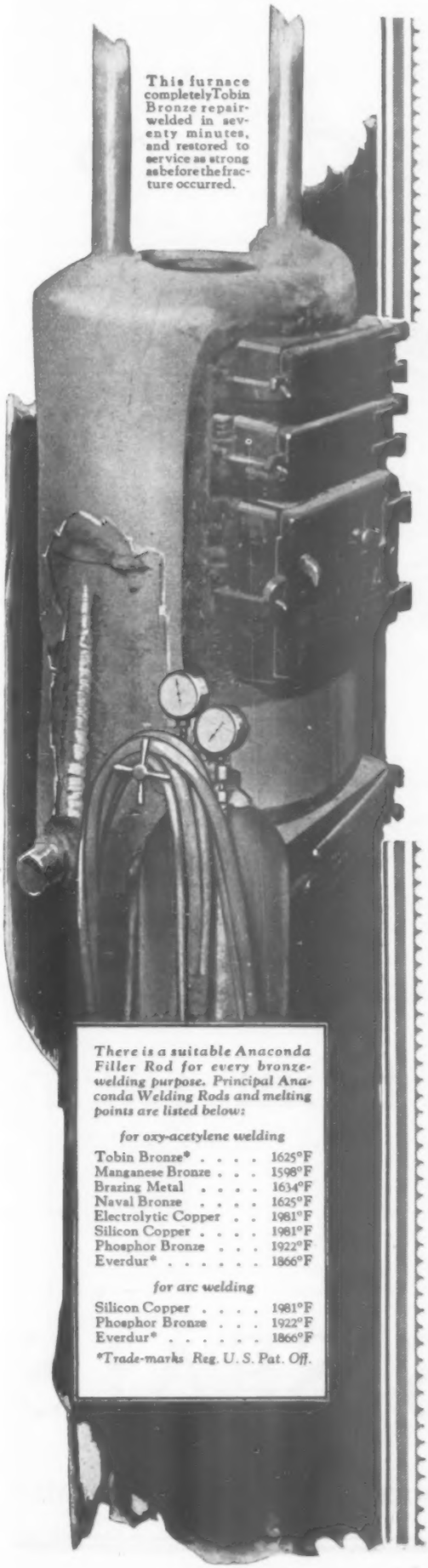
The following changes in personnel and position have recently been made by Modern Engineering Co., St. Louis, Mo.: Mr. A. V. Fausek has been appointed district sales manager for the local St. Louis territory; and Mr. John J. Keane has been appointed territorial sales manager in charge of the entire distribution of MECO equipment.

Austin-Hastings Co., Inc., 226 Binney St., Cambridge, Mass., distributors of Wilson electric welding equipment, have recently made arrangements to carry Smith oxy-acetylene equipment, and are in a position to offer customers immediate service on both lines.

On November 6 Mr. L. Zengler, chief engineer of Keith Dunham Company, Chicago, sailed on the S. S. Bremen for Bremen, Germany, making his first visit with his family after several years of service in the above position.

E. L. Mathy and W. S. Heasley, of Victor Welding Equipment Co., San Francisco, stopped in Chicago, October 25 and 26, following an extensive trip through the eastern states to arrange additional sales and service facilities in those territories for Victor apparatus.

In an item published last month regarding the representation of the Electric Arc Cutting and Welding Company of Newark, N. J., in the Dallas, Texas, District, it should have been noted that the representative appointed was the Paul G. Bentley Co., 1018 Allen Bldg.



This furnace completely Tobin Bronze repair-welded in seventy minutes, and restored to service as strong as before the fracture occurred.

There is a suitable Anaconda Filler Rod for every bronze-welding purpose. Principal Anaconda Welding Rods and melting points are listed below:

for oxy-acetylene welding

Tobin Bronze*	1625°F
Manganese Bronze	1598°F
Brazing Metal	1634°F
Naval Bronze	1625°F
Electrolytic Copper	1981°F
Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

for arc welding

Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

**Trade-marks Reg. U. S. Pat. Off.*

Only 70 minutes

for repair welding this furnace with

TOBIN BRONZE

Trade-mark Reg. U. S. Pat. Off.

THE water jacket of this furnace cracked through, due to a freeze-up, and rather than incur the heavy expense and delay of securing a new casting, the problem was submitted to an experienced welder. One hour was spent in V-ing the fracture. Welding was done by one man in 10 minutes using one pound of Tobin Bronze Welding Rod and 14 feet of oxygen and acetylene. No pre-heating was necessary, as Tobin Bronze flows freely at 1650 degrees F.

Had the same work been done with cast iron filler rods, pre-heating time would have taken an entire day, and welding time about two hours. In this instance, as in many others on record, Tobin Bronze welding justified its use by effecting important economies in time, materials, labor and money.

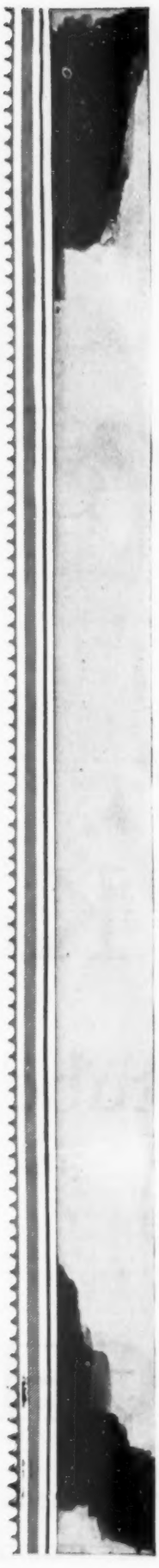
The uniform composition, ductility and strength of Tobin Bronze and other Anaconda Copper Alloy Welding Rods is due to the experience and technical knowledge of The American Brass Company in developing alloys suitable for all welding purposes where copper alloy rods can be used. The manufacture of Anaconda Welding Rods, from raw materials to finished product, is attended with the most scrupulous care.

Additional information regarding Anaconda Welding Rods for oxy-acetylene welding and electric arc welding, is contained in Publication B-13, which will be sent free upon request.

THE AMERICAN BRASS COMPANY
GENERAL OFFICES: WATERBURY, CONNECTICUT
Offices and Agencies located in all the Principal Cities

ANACONDA
WELDING RODS

ANACONDA
from mine to consumer



Keep

tuberculosis away from them

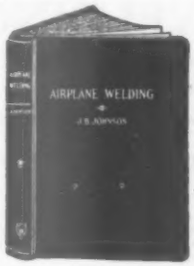
BUY

CHRISTMAS SEALS

THE NATIONAL, STATE, *and* LOCAL TUBERCULOSIS ASSOCIATIONS *of the* UNITED STATES

AIRPLANE WELDING

By J. B. JOHNSON, M. E.



Between the covers of this timely book is packed a vast fund of information on the art of welding in aircraft design, construction and repair. It covers every method of welding—every type of weld—every weldable metal—in plain, every day language. It shows how welding enters into aircraft design—how ships are fabricated and built with welds—how repairs are made, and how to make all the different kinds of welds. The author has had a wide experience in actually doing and supervising the kind of work which he describes so well for you in his book.

He has conducted experiments and made thousands of tests of various kinds, and is considered everywhere a real authority on the subject.

A book that talks right from the shoulder in the language of the shops—easy to read and easy to understand. You can get every point easily and quickly.

Over 300 pages. 210 illustrations. Flexible binding. Order now. Sent postpaid $3.50. Size 5½"x8".

The Welding Engineer Publishing Co.
608 S. Dearborn St., Chicago, Ill.

REP FLUX and REP RODS

The Solution of Your Problems In The Repair of
Scored Cylinders, Water Jackets, Radiators

The great need for a Flux which will absolutely Tin Cast Iron has, after years of experiment by the Kansas City Oxygen Gas Co. been supplied in Rep Flux.

Rep Flux will tin any metal but Aluminum — pre-heating unnecessary—only a small flame is needed.

Rep Flux will tin scored cylinders without removing block from chassis. Scores are then filled by applying Rep Rods by small welding flame.

PRICES

Rep Flux per ½ lb.	$1.75
Rep Flux per lb.	3.00
Rep Rods per lb.	3.00

Quantity prices on request.

Complete catalog Welding and Cutting equipment and supplies furnished on request.

Kansas City Oxygen Gas Co.
Pioneer Gas Manufacturers of the West
2012 Grand Ave. Kansas City, Mo.

"Fuserite" is the trade name given to the welding rods sold by Harris Sales Company, 1139 S. 58th St., Philadelphia, Pa.

In the September, 1929, issue of "Machine Design," R. E. Kinkead, consulting engineer, has contributed a paper entitled "When Should Welding Be Employed in Machine Design."

C. E. Phillips, formerly district manager of the Purox Company at Detroit, Michigan, has recently organized the firm of C. E. Phillips & Co., with headquarters at 633 W. Larned St., Detroit. The firm handles the products of the Stoody Co., Whittier, Calif., in the states of Indiana, Illinois, Michigan, Minnesota, Kentucky and Wisconsin. They are also handling Tube Turns in the eastern part of Michigan and welding wire made by the Indiana Steel and Wire Co.

Following the consolidation of the Gibb Welding Machines Co. and the Thomson Spot Welder Co., the Chicago offices of these two companies are being consolidated in a new and larger office in the new Daily News Building under the new firm name, Thomson-Gibb Electric Welding Co. C. O. Watson is manager and R. B. Strout, assistant manager.

Weldit Acetylene Company, Detroit, has recently opened a service station, sales office and display room at 7405 South Michigan Ave., Chicago.

Classified Ads

Help Wanted—75c per line, minimum 4 line
Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Counted 8 words to line. Add 6 words for keyed address.

CLASSIFIED ADVERTISEMENTS

Consulting Service—Welding engineer with wide experience with production work offers consulting services on subjects pertaining to welding wire, oxy-acetylene, electric arc and resistance welding. Address 219, care Welding Engineer.

Position Wanted—Welder with twelve years experience in gas welding, five years as demonstrator, three years job shop experience on all metals. Married. Will go any place for steady employment. Address Box 212, care of The Welding Engineer.

For Sale—Lincoln 300 ampere welder, powered by Buda gasoline motor and connected to 120 cubic foot air compressor. Unit mounted on two ton Dodge truck. Has complete set of tools for general pipe line oil field repair. New 1929. Write to J. V. Kimerer, P. O. Box 91, Pittsburgh, Pa.

Salesman Wanted—For oxy-acetylene welding equipment. State full particulars in first letter regarding territory, salary and past experience. Address Box 213, care of The Welding Engineer.

Position Wanted—Welding Engineer. University graduate. Twelve years experience, comprising management of welding shop, sales service and engineering work for leading gas and apparatus manufacturer. Address Box 214, care of The Welding Engineer.

REBUILT ARC WELDERS

We have in stock General Electric and Lincoln Electric motor drive welders; also GE and Wilson gasoline engine drive welders. We buy, sell and repair welders. We are also factory representatives for new machines.

GOODMAN ELECTRIC MACHINERY CO.,
126 Green St., Newark, N. J.

PHILADELPHIA, PA.
Gas and Electric Welding Wire

EDGCOMB STEEL
Distributing for
AMERICAN STEEL & WIRE CO.

NEWARK, N. J.
A Type for Every Purpose

PREMIER TESTED WELDING WIRE
Complete Stocks for Immediate Delivery

TISCO

MANGANESE STEEL WELDING WIRE $\frac{1}{8}$" to $\frac{5}{16}$" dia.
STOCK SHIPMENTS

The premier rod for the repair, or building up of worn Manganese Steel Track-work and other castings requiring a hard tough surface. Manufactured by the makers of Tisco Manganese Steel; the first in America to produce this remarkable metal.

WM. WHARTON JR. & CO. INC. EASTON, PA.
TAYLOR-WHARTON IRON & STEEL CO. HIGH BRIDGE, N. J.

WANTED
WELDING EQUIPMENT AND SUPPLY SALESMEN

To handle a side line specialty which will not conflict. Replies will be treated in confidence. Our employes know of this advertisement. Address Box 215, care of The Welding Engineer.

Salesman Wanted—Manufacturer of motor generator type, electric arc welding apparatus has some territories open for live agents on profitable basis. Write fully in confidence, giving age, experience, etc. Address Box 216, care of The Welding Engineer.

Position Wanted—Boilermaker-welder. Eleven years all 'round experience electric arc, acetylene, atomic hydrogen. First-class man oil field, pipe line, refinery, sheet metal, job shop, foundry, aircraft. Sales and demonstration experience. Married. Wants good connection. Address Box 217, care of The Welding Engineer.

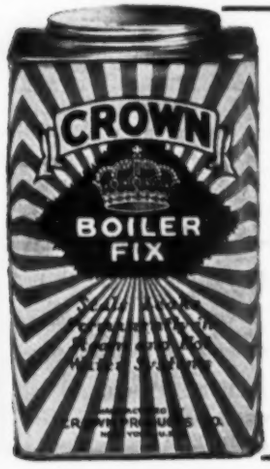
Wanted—Man with practical experience and some knowledge of the metallurgy of gas cutting and gas welding and electric arc welding of plain carbon and alloy steel castings. The foundry is located in Pennsylvania. When replying please state age, experience, technical training, married or single, and salary desired. Also state references. Address Box 218, care of The Welding Engineer.

Membership In The American Welding Society Is Testimony Of Your Interest In Welding.

Send Your Request For Application Blank To

American Welding Society

33 West Thirty-Ninth Street New York, N. Y.



Crown Boiler Fix is a metallic powder with an aluminum base and is used by thousands of master plumbers and welding shops with great success for repairing steam and hot-water boilers. This compound is entirely different and far superior to any boiler compound on the market.

Crown Boiler Fix is applied by simply mixing contents of can with two quarts of hot water and pouring into boiler.

The unusual and superior feature is that after being poured into boiler and repair is completed the compound never becomes harder than tar, thereby overcoming the most severe trouble encountered in boiler repair, that of expansion and contraction, as Crown Boiler Fix, acting like tar, will expand and contract under all adverse conditions. After electric welding a boiler, a can of Crown Boiler Fix will make the weld absolutely water-tight and will permanently repair all cracks that are impossible for the welder to reach.

Crown Boiler Fix is the only compound that will not discolor the water. Water in water gauge is the same after applying Fix, as before.

Price, $8 per can, less 50% and 10%.
One can free with every six.

Crown Radiator Fix makes electric welds on cast iron permanently water tight; also repairs cracked water jackets, motor heads, leaky radiators, etc.

Crown Radiator Fix is different from any other compound on the market. It is a metallic powder containing a quantity of crushed aluminum.

Crown Radiator Fix is absolutely guaranteed not to clog radiator as it only congeals when in contact with air.

Immediately after being poured into radiator, the compound circulates through the entire water system and starts to work.

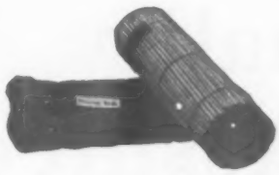
As the water leaks through the cracks and porous parts it carries with it the Crown Radiator Fix, which instantly upon coming into contact with the air, congeals and forms a permanent metallic repair.

Price, $12 per doz., less 50%. Prices on larger quantities on application.

Manufactured by
CROWN PRODUCTS CO.

Sole Distributors:
CROWN ALUMINUM SOLDER CO., 881 E. 134th St., New York

For Welding Wire Value and Satisfaction



Seneca
Brand
Welding
Rod

Your first consideration should be the source of supply. Can you get wire which is of the correct composition and finish for your work? You can if you order from the SENECA line, because the SENECA line is complete. Each grade and each type deserve your confidence. Years of experience are back of the selection of all materials which we furnish and our engineering service makes that experience available to you. It is a natural result that SENECA values are attracting more SENECA customers every month. Let us quote on your requirements.

SENECA WIRE & MFG. CO.
Established 1905
Fostoria Ohio

Sales Representatives Wanted—Commission Basis

Big Jim (Master Welder) *says:*

I see the Atlas people have come out with a brand new welding rod—ATCO—with all the good FRE-FLO qualities except the accurate sizing. It's made in regular commercial sizes . . . but it's exactly the same material as FRE-FLO.

I'm strong for FRE-FLO because I'm particular about size . . . but for the fellow who isn't fussy about sizes there's no better welding rod made than ATCO.

Ask for a free sample of FRE-FLO to try in your shop.

Big Jim (MASTER WELDER)

Our Rods are sold only through distributors. A few desirable territories are still open. Correspondence from distributors is invited.

The Atlas Foundry Company
DEPT. "A"
W. 69th & W. & L. E. Ry. Cleveland O.

WELDRITE
TRADE MARK REGISTERED

ARC WELDING MACHINES

WELDRITE Junior
For the welding shop or plant maintenance. 175 Amp. Price $450.

Proven Superior From Every Standpoint

Write us for information

THE ELECTRIC WELDING MACHINE CO.
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FACTORIES: Detroit, Mich.; Walkerville, Ontario

HANDY & HARMAN
HANDY SOLDERS
QUALITY SERVICE

It is Better to be
SURE
at the Start than
SORRY
at the Finish

Nowhere does this apply more pertinently than in your *Welding, Brazing* and *Soldering.*

For best results use

Handy Silver Solders

which flow freely at 1325° to 1600° F. make neat, strong, permanent joints and connections, in Copper, Brass, Bronze, Extruded Brass and Bronze, Steel and Stainless Steel, Nickel, Nickel Silver, Monel Metal—and all other metals fusing above 1325°.

Send for your copy of the Handy Book of Silver Solder (W).

HANDY & HARMAN
Executive Offices
57 WILLIAM ST., NEW YORK

Plants
Bridgeport, Conn. Providence, R. I.
Fulton & Gold Sts., New York City

Uniform Quality Assured

WELDERS who use Commercial Acetylene soon learn that every cylinder contains the same pure gas.

Your torch can tell the difference!

COMMERCIAL ACETYLENE
Means pure acetylene.

COMMERCIAL SERVICE
Means prompt service.

No matter what your gas requirements may be you will be interested in our sales plan. Ask our nearest office to tell you about it.

Supplied in the following size cylinders:

10x30-in. size - -	125 cu. ft. cap.
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Commercial Acetylene Supply Company, Inc.

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New York City

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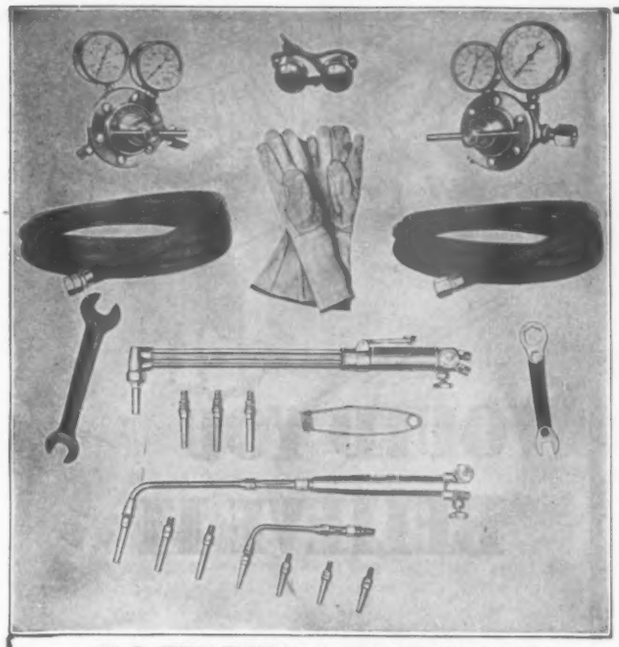
708 Thrower Bldg.
Atlanta, Ga.

683 Atlantic Ave.
Boston, Mass.

417 Market Street
San Francisco, Calif.



Have a K-G Outfit Ready for the Next Break.

BECAUSE breakdowns are not made to order you cannot tell how large or how small the next one will be. You do know that you must be prepared to repair it immediately or lose money while you wait for new equipment. This complete K-G unit for welding and cutting is your insurance against long shut-downs. Its range of service is so complete that you can depend upon it for every job.

K-G Welding and Cutting Torches are guaranteed to be absolutely free from back-flashing. Simple and scientific construction makes this possible at a reasonable cost. Perfect fitting tips and smooth operation conserve gas and time. A K-G Torch will increase your respect for the oxy-acetylene process.

K-G WELDING & CUTTING CO.
515 W. 29th St. New York City

The following K-G dealers are ready to take care of your apparatus requirements promptly.

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WISCONSIN MOTOR PARTS CO.
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PASSAIC-BERGEN WELDING WORKS
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SUTTON-GARTEN CO.
217 W. 10th St.
Indianapolis, Ind.

E. BRASS AUTO SUPPLY CO., Inc.
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WELDING & SUPPLIES COMPANY
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HARRY P. WINSLOW
35 Vinton St.
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SIGHT FEED GENERATOR CO.
W. Alexandria, Ohio

CHICAGO GRINDING & MACHINE CO.
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CENTRAL OHIO WELDING CO.
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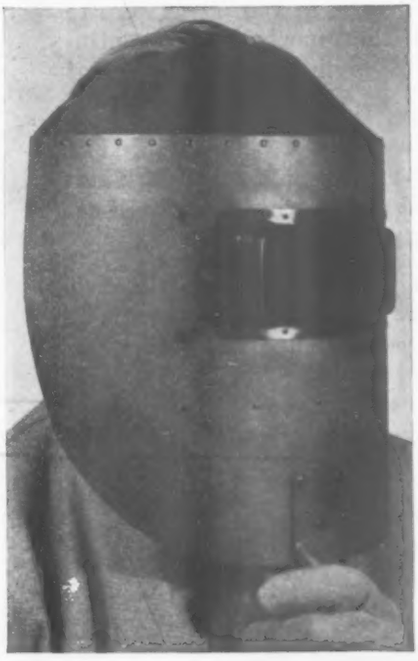
Columbus, Ohio



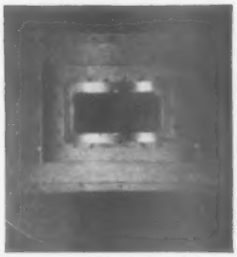
Willson Electric Welding Handshield - - - Style No. 2

No. 2 handshield is made of strong vulcanized black fibre. The handle is of proper shape and thickness to afford a good grip and good balance. The bib on the inside of the handshield gives protection from underneath flashes. There is also a special eye-shield which fits closely to the eyes of the welder, protecting him from reflections and flashes from nearby work. This shield is easily detachable.

The glass is Willson-Weld and is protected by a clear cover glass. The method of glass retaining is unusually simple, and effective, and they can be easily replaced. Specify glass shade when ordering.

The sturdy construction of No. 2 handshield, together with Willson-Weld glass, makes it one of the most popular handshields on the market today. Each handshield comes packed in a cardboard container.

Price, $9.15 each, f. o. b.



The eye shield used in Style No. 2 fits close to the welder's face protecting him from reflections and flashes. It is easily detachable to simplify lens changing.

Willson Products, Incorporated

Reading, Pennsylvania

Quick Melting, Free Flowing, —WISSCO ROD assures a better weld!

THE quick melting, free flowing qualities of Wissco Welding Rod assures greater penetration of the metal with a consequent stronger weld.

Every length of Wissco Rod is pretested for quality and uniformity. Being free from impurities no hard spots or pores are created in the weld.

Wissco Rod is manufactured in ten grades, each grade of special composition for a specific type of welding job. Our welding engineers will specify the grade most suitable to your requirements, with greatest economy. Simply tell us the nature of your welding work.

Prompt deliveries from our nearest warehouse.

Wickwire Spencer Steel Company
42 E. 42nd Street
New York City

WICKWIRE SPENCER STEEL CO.

WISSCO WELDING RODS

WOULD YOU BELIEVE IT ?

If you met a friend coming out of a fish store like this and he started to tell you how he caught that big fish and had just been in showing the family fish dealer what a real fish looked like, you'd be rather skeptical about the truth of his statements.

That's just the way we feel it would appear to you if we were to publish the reports we are continually receiving from users of Bridgeport Welding Rod.

We want you to be convinced of the superiority of Bridgeport Welding Rod not by what others tell us, **but by your own experience.**

Here is our offer: We will send you free a generous sample of any Bridgeport Welding Rod. Check the size and type you wish to test, and mail us the coupon. Give it a fair trial—and judge its merit for yourself.

BRIDGEPORT BRASS COMPANY
BRIDGEPORT, CONN.

COUPON

Bridgeport Brass Co., East Main St., Bridgeport, Conn.
Send me a free sample of the Bridgeport Welding Rod checked below. I'll give it a fair trial.

Bronze	¼" ☐	5/32" ☐	⅛" ☐
Manganeze Bronze	¼" ☐	5/32" ☐	⅛" ☐
Brazing Rod	¼" ☐	5/32" ☐	⅛" ☐

Name .....
Company .....
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City ..... State .....
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HOME OF HICARWELD RODS

Large stocks of Hicarweld and other Welding Rods ready for immediate shipment are carried in our Chicago Warehouse, illustrated above.

Hicarweld is especially adapted to parts subjected to very severe wear—worn spots on rails, frogs, crossings, conveyor buckets, etc. A high carbon steel rod which produces a very hard deposit. Supplied for electric or gas welding.

A Rod for Every Job in Gas and Electric Welding

Our principal kinds of Welding Rods are:

WILSON COLORTIPT	CASTWELD	HIGH MANGANESE	ELECWELD Nos. 10 and 18
NORWELD SPECIAL	BRONZEWELD	NICKELWELD	STEELWELD
NORWELD	HICARWELD	ELECWELD SPECIAL No. 6	VANADWELD

Send for the Welder's Guide, a Practical Book on Welding

J. A. Roesch, Jr., *Pres.*
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STEEL SALES CORPORATION

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STEEL—MONEL METAL—NICKEL—BRASS—COPPER—COPPERWELD—NICKEL SILVER—NICKELOID—PHOSPHOR BRONZE—ALUMINUM

WHARTON

Standard for Oxygen, Hydrogen, etc.
Meet all I. C. C. requirements.

EVERY safeguard for physical perfection. Strong ductile high manganese carbon steel that avoids heat treatment with drastic temperature change. Used in a process that permits more decisive inspection.

As the added protection and value cost no extra, Wharton Cylinders should be your choice.

A TAYLOR-WHARTON PRODUCT

William Wharton Jr. & Co., Inc.

Cylinder Sales Office:
110 E. 42ND ST., NEW YORK
Plant at Easton, Pa.

CYLINDERS

Cut the Cost of Gas Welding from 25% to 40%, by using the

WELDIT GASAVER

to check gas wastage

WHEN you stop welding, hang the torch on the handy hook. The flame goes out. Gas consumption stops. To start again, lift the torch from the hook, pass tip over pilot light, and you're ready again, with the same flame adjustment. No gas burned while torch is idle. **All Weldit Gasavers are equipped with special valves which automatically close should the torch flash back, thus preventing injury to operator or equipment.**

Approved by
National Board of Underwriters
Licensed Under Basic Patents

Welding Torches	Cast Iron Rods
Cutting Torches	Welding Hose
Regulators	Brazing Wire
Lead Burning Equipment	Fluxes & Solders
Welding Wire	Safety Gloves
Welding Goggles	Service

WELDIT ACETYLENE CO.

634 Bagley Ave. DETROIT, MICH.

Buy on the "Shop test" Saves welding labor

WELDING is an art. The most skilled in the art cannot produce uniformly perfect welding jobs nor avoid spoiled work . . . unless the wires or electrodes are uniform.

Uniformity in welding wires and electrodes concerns more than chemical analysis. Page *processing* assures physical and structural uniformity which is further proved and checked by constant *"shop testing."* Page maintains complete welding equipment for this purpose of inspection.

Close check on chemical analysis is made in conjunction with actual shop testing. Help your welders this much: Give them the correct wire or electrode for the job. The Page research and welding engineering staff is at your service.

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General Sales Office: **New York Central Building**

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An Associate Company of the American Chain Company, *Inc.* Bridgeport, Conn.

District Offices: Pittsburgh, Chicago, San Francisco

Canadian Distributor and Manufacturer: Frost Steel and Wire Co., Limited, Hamilton, Ontario

PAGE-ARMCO

FLAME TESTED PROCESSED SHOP TESTED

Welding Wire and Electrodes

The way to get what you pay for is to buy it

If you are using acetylene regularly you will pay for a generator eventually, but you won't get it unless you buy it. Ask for a price on carbide and figure four or five cubic feet of acetylene to a pound of carbide. Compare this with the cost of acetylene in tanks, and you will see how you are paying for a generator and not getting it. If you have been doing all your welding and cutting with tanks, there's money for you in a

SIGHT FEED ACETYLENE GENERATOR

Approved by the Underwriters

A safe, convenient and economical way to obtain acetylene. This generator has several exclusive features.

Made in four sizes to suit the requirements of any shop. Uses carbide of a standard size.

SIGHT FEED GENERATOR CO.

West Alexandria, Ohio — 110 E. 42nd St., New York City

Write for complete details

IDEAL FACE SHIELDS

Ideal Face Shields protect the head, chest and neck against direct and reflected rays. Easily adjusted and removed. Constructed of vulcanized fibre and aluminum, assuring durability and lightness. Hinged door allows quick inspection of work or interchange of glasses.

IDEAL WELDING GLOVE

The Ideal Glove for Electric and Acetylene Welders is made from Sheep Skin, which has been Subjected to an Asbestos Treatment and which makes it both heat resisting and fireproof.

IDEAL WELDING APRON

The Ideal Apron for Welders is made of leather which has been especially treated to stand the heat, and at the same time be very flexible and durable.

THE IDEAL FACE SHIELD CO.

468 N. Garfield Ave., COLUMBUS, OHIO

You Can Do It Better With TORCHWELD

On thousands of welding or cutting operations all over the country Torchweld is proving daily its unequalled superiority.

Present day conditions demand equipment which combines speed, economy and endurance with absolute dependability and low maintenance cost.

The exceptional sturdiness of construction makes Torchweld virtually immune from operating troubles for they are built better and last longer.

for

Staunchness

use

"Built To Stand The Abuse of Constant Use."

Send for Catalog No. 29E

TORCHWELD EQUIPMENT COMPANY
224 N. Carpenter St., CHICAGO

Ordinary coke and limestone

will *not* make extraordinary carbide.

Hence National uses only

the purest ingredients it can get.

Write for illustrated story

NATIONAL CARBIDE

SALES CORPORATION, 342 MADISON AVENUE, NEW YORK

THOMSON-GIBB WELDING SERVICE

WE offer the services of our engineers FREE in helping you to

IMPROVE YOUR PRODUCTS
INCREASE YOUR PRODUCTION
REDUCE YOUR COSTS

THOMSON-GIBB welding systems are daily assembling thousands of gasoline tanks, cooling fans, mufflers, heaters, fenders, body parts, accessories, etc. Wherever metals are to be joined together THOMSON-GIBB welding systems will do the job faster, cheaper, cleaner, more securely, and more uniformly than any other known method.

When shall we send our engineers to study your problems? This service will obligate you in no way and our recommendations may save you thousands of dollars a day.

Write today!

THOMSON-GIBB ELECTRIC WELDING COMPANY

Manufacturers of
ARC, SPOT, SEAM, BUTT, AND AUTOMATIC ELECTRIC WELDING MACHINES
Factories at
LYNN, MASS. BAY CITY, MICH.
Offices in all principal cities.

THE WELDING FLUX FOR ALL METALS
SUNRAY
TRADE MARK

WELDING AND BRAZING FLUX

For ALL METALS

INTERNATIONAL OXYGEN COMPANY
Main Offices: Newark, N. J.
Branches: New York, Pittsburgh, Toledo, Buffalo
New England Division
The Tariffville Oxygen Company, Tariffville, Conn.

BESIDES THE EYES

Safest — *Adjustable* — *Most Comfortable* — *Balanced*

POSITIVE PROTECTION

MODEL "00" is a fully patented helmet and its principal feature is a self-adjusting, sliding lock arrangement which enables the helmet to be worn in either its active (down) or inactive (up) position. It is impossible for the lock to become worn or loosened. No slipping or sliding over the face while the work is being laid out.

PRICE Complete with ESSENTIALITE Lens

$7.50 each

Manufactured by

CHICAGO EYE SHIELD COMPANY
2300 Warren Ave., Chicago, Ill.

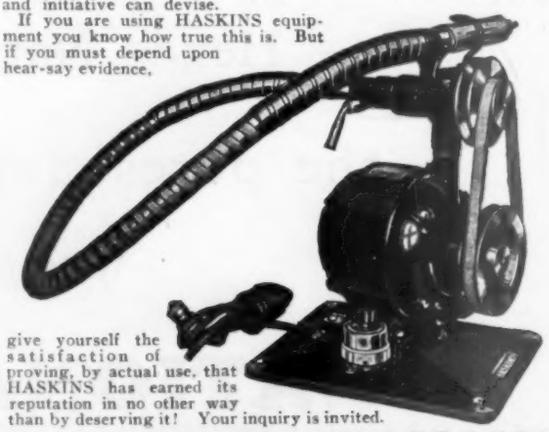
Save These For Work a Machine Can't Do

" . . . . . they, while their companions slept, were toiling upwards in the night"—LONGFELLOW.

Achievement knows no holidays. To be in the vanguard of progress one must be "up and doing" every minute of the day. And HASKINS has applied these precepts in the ceaseless effort to keep its product ever superior.

Never content with what has been done, HASKINS continually strives to better the "best" of yesterday. Consequently, the user of HASKINS Flexible Shaft Tool Equipment enjoys every late feature and improvement of practical character which ingenuity and initiative can devise.

If you are using HASKINS equipment you know how true this is. But if you must depend upon hear-say evidence,



give yourself the satisfaction of proving, by actual use, that HASKINS has earned its reputation in no other way than by deserving it! Your inquiry is invited.

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Portable Flexible Shaft Machinery
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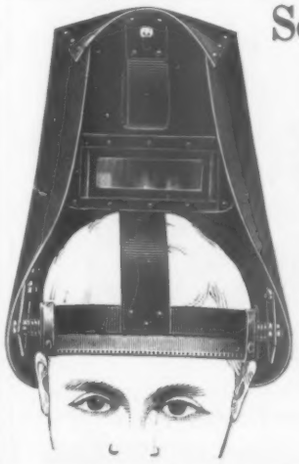

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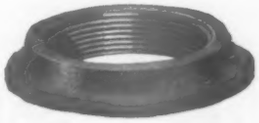

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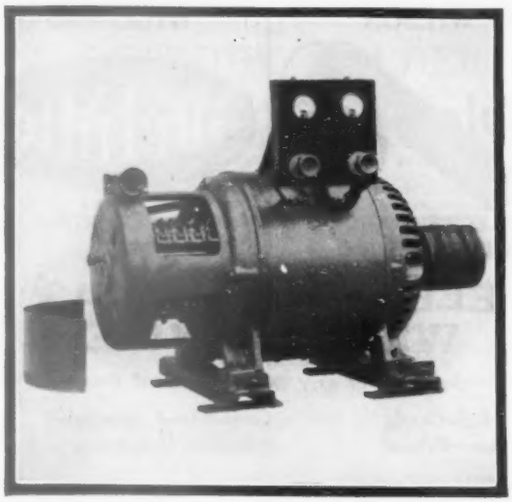

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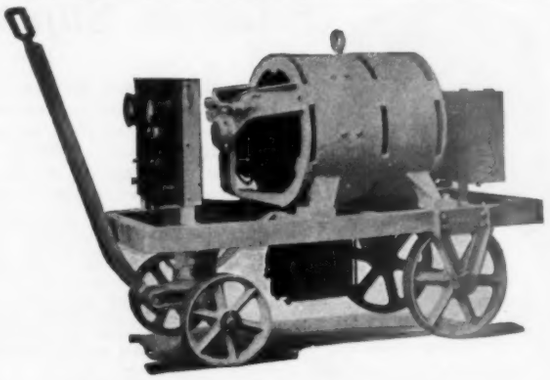

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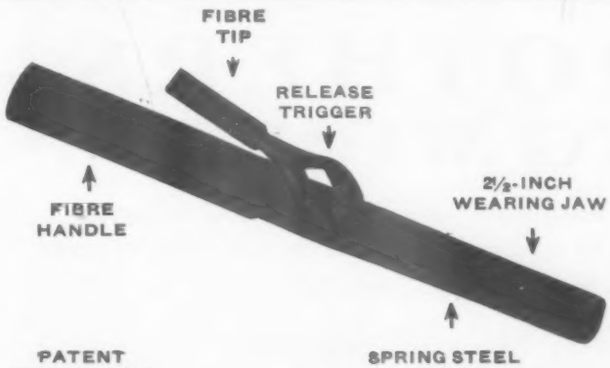

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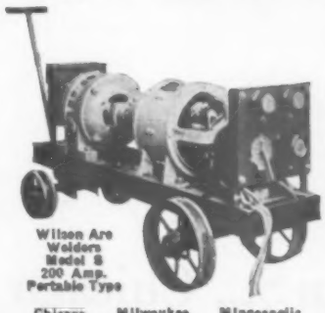

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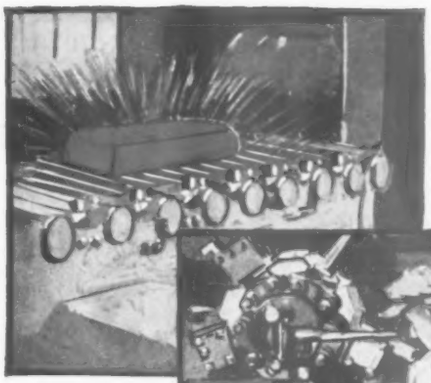
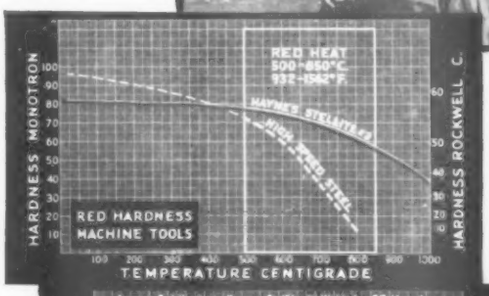
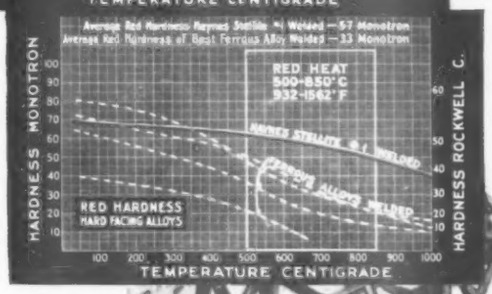
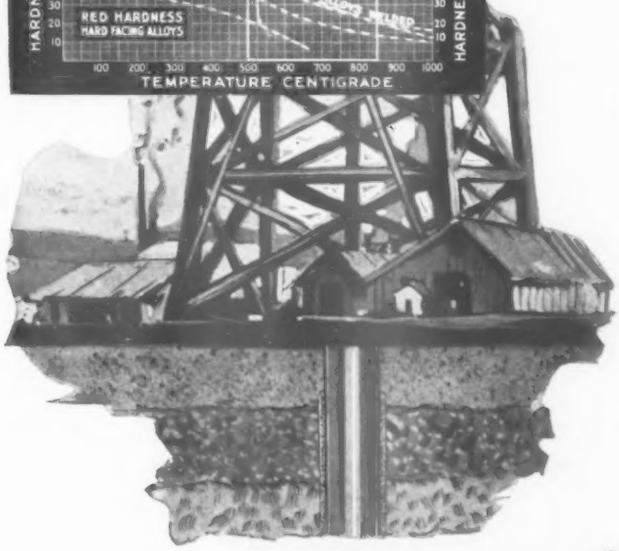
Red Hardness— What Metal Has It?









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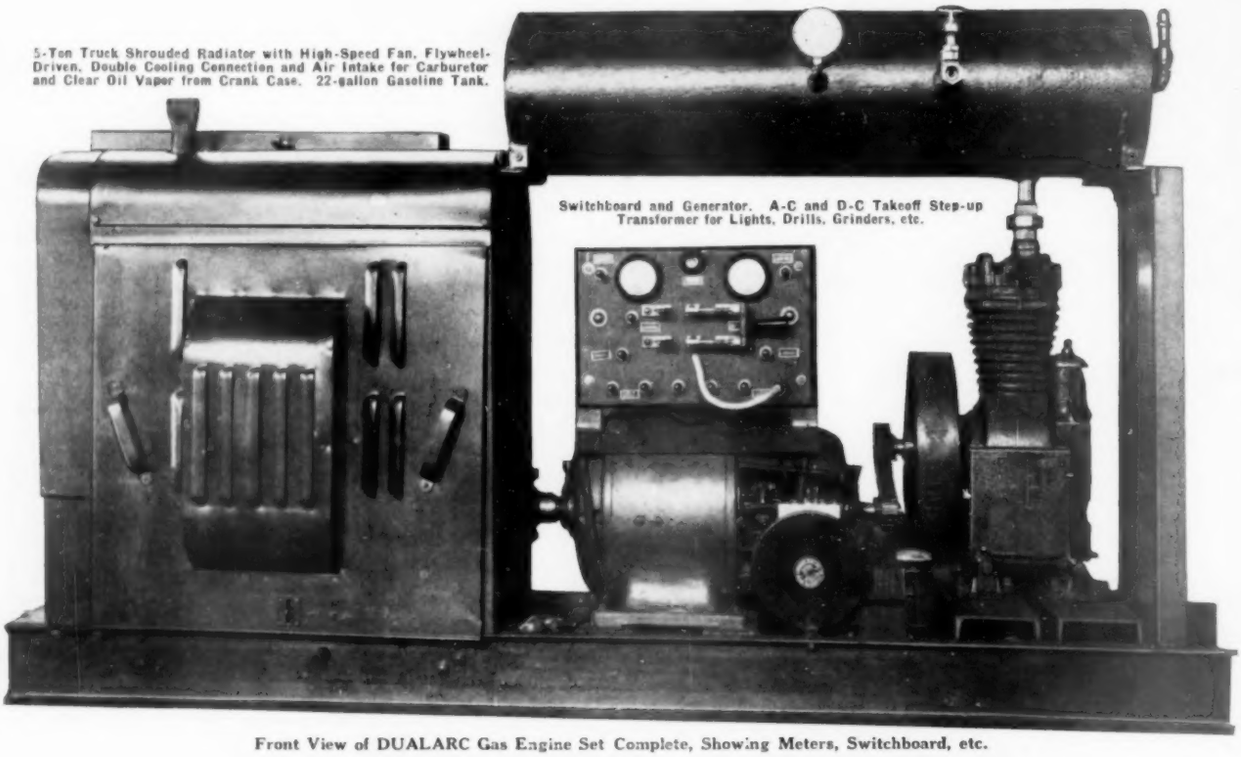
Haynes Stellite welding rod is also available from any of the 28 District Sales Offices of Oxweld Acetylene Company

HAYNES STELLITE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Front View of DUALARC Gas Engine Set Complete, Showing Meters, Switchboard, etc.

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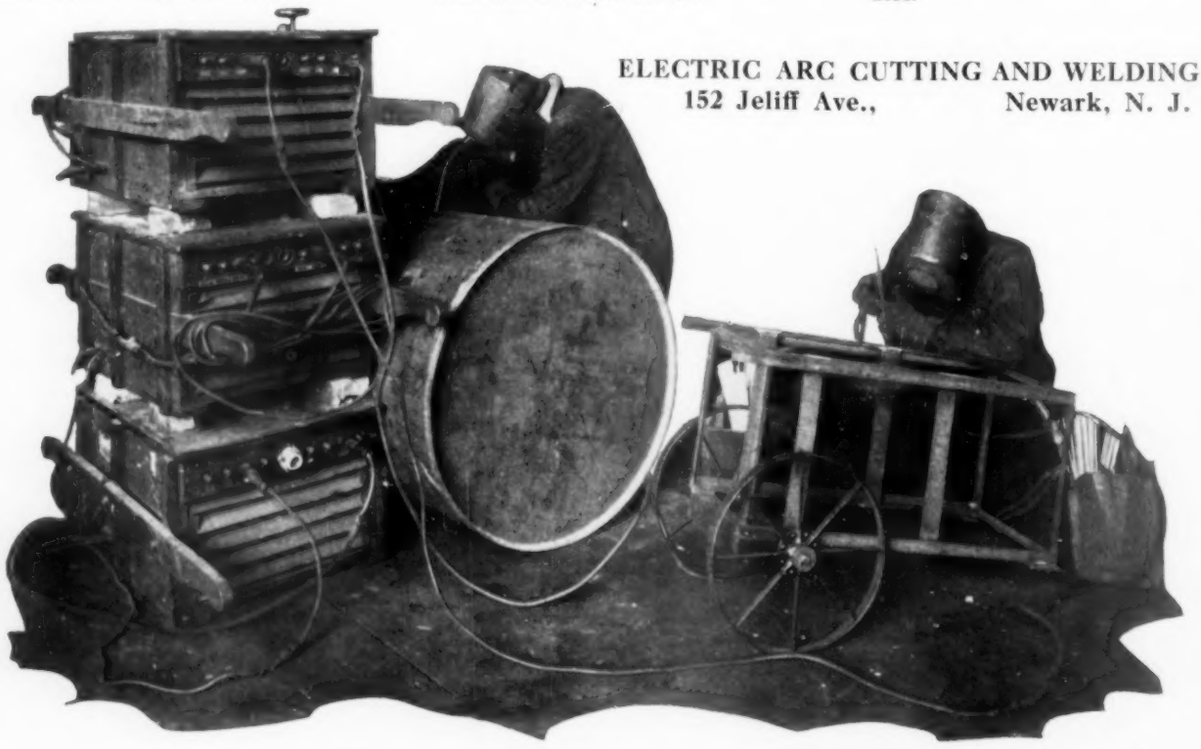

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